Integrated Technologies, Inc.

UW-FAA Center of Excellence on Advanced Materials.

1-29-2004
Outline

• Background
• Capabilities
• Experience
• Vision
Background

Intec was formed in 1989.

Maryann Einarson - President
Brian R. Coxon - Director of Engineering
Robert C. LaMantea - Director of Sales & Marketing
Rod Wishart - Operations Manager
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<th>Boeing (Hughes) Space &amp; Communication</th>
<th>Teledesic</th>
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<td>Allied Signal</td>
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<td>Bell Helicopter</td>
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<td>Boeing</td>
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<td>Phillips Petroleum</td>
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<td>Cytec</td>
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<td>Rhone - Poulenc Chemical</td>
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<td>Rockwell - Rocketdyne</td>
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<td>Shell Development</td>
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<td>Alenia (GEC) Marconi</td>
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<td>Toray Composites America</td>
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<td>General Electric</td>
<td>YLA Incorporated</td>
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<td>Hexcel</td>
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<td>Aviation Partners</td>
<td>Honeywell</td>
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Corporate Philosophy

Intec’s goal is to maintain a “materials technology center” offering our clients the full range of services for development, evaluation, characterization and use of materials.

1) Materials/Process Development
2) Materials Characterization
3) Component Design, Fabrication, Testing and Machining
4) Preliminary Design & Product Development
5) Consulting Services
Capabilities

-Testing-

- Automated static testing (tens, comp, shear, toughness, etc.)
- Fatigue, damage tolerance and crack growth
- Loads up to 2.5 million lbs. (data channels 400+)
- Environments (-400°F to 1,000°F, hydraulic grips to 600°F)
- High speed video, real time Moiré, photoelasticity
- Ultrasonic, microscopy and physical property laboratories
- Thermal analysis (DMA, TMA, DSC, CTE, CME)
- Load Floor – Strong Back
- Low and high velocity instrumented impact of large structural panels
Web Based Monitoring Capabilities

WBTM uses a synchronized video/sound signal along with digital test data (load, stroke, & strain) to provide clear picture of the test and test data as it is occurring.
Selected Certifications
-Testing - Manufacturing

- NADCAP Certification
- Boeing D1-4426 “CQS” Quality Standard
- USAF MTAPP
- CCR, Defense Logistics Agency
- EDC PTAC
- Sikorsky (Lab 9 Composites Testing Facility)
- Cessna Aircraft

Intec maintains a high level of quality by proactive uses of our ISO 9001 compliant quality systems. Additionally, Intec conforms to the requirements of MIL-I-45208A as the sections apply to our facility. Intec maintains the highest level of calibration with reference to MIL-C-45662 and calibration is performed on a periodic basis.

Calibrations at Intec are performed to standards traceable to the National Institute of Standards and Technology (NIST).
The certification tests for APB’s 737-BBJ blended winglet.

Multiple actuators applied load through 3 wiffle trees with load pads to simulate aerodynamic loads.

Reaction fixtures were designed for more than 500,000in-lbs bending moment with less than 0.02” overall deflection.

The specific aim of this test was to show compliance with FAR 25.305 (a)(b) and 25.307.
737 BBJ Winglet Test to Failure
Intec has been pursuing the use of high-temperature graphite titanium sandwich structure as a lower cost, lower weight alternative to super plastic formed titanium structures in elevated temperature applications.
General Aviation Spar Test Setup

Close up of failure
600 KIP Hydraulic Test Frame
Hydraulic Test Frames
Specialized Fixturing
Specialized Fixturing
Specialized Fixturing
Transverse Tension Fixture

Transverse tension fixture
Specialized Fixtures
K2 Snowboard Binding
Large Shear Panel Test Fixture
Large Shear Panel Test Fixture
Large Notch Panel Test Fixture
MTS TestStar IIs
Composites Testing

*Mechanical:*
- Static, fatigue, spectrum, creep, impact, fracture toughness, multi-axis, and full-scale loads to 2.5M lbs., coupon level and component level testing with more than 600 channels of data

*Coupon Testing:*
- Metallic and fibrous composite materials
- Automated static testing (tensile, compression, shear, etc.)
- Fatigue, crack growth and damage tolerance testing
- Manufacturing of all test coupons and panels
Composites Testing

Environments:
• Thermal cycling and environmental exposure (-420°F to 2500°F)

 Thermal analysis:
• DSC, DMA, TGA, FTIR, TGA, CTE

Physical Properties
• Void, density, volume fraction, flammability, outgassing, ultrasonic pulse echo and TTU

Photography
• Stills, high resolution digital, microscopy, high speed video, shadow moiré, in-plane moiré, photoelasticity
Composites Testing - Sea Launch

- Pre-conditioning and environmentally controlled tests (-320°F to 1800°F)
- Strain gage selection and mounting, over 600 data channels
KGR-1 Test Setup
Capabilities
-Senior Engineering Staff-

- More than 30 years experience
- Materials, analysis, design, management
- Technology development
- Preliminary design
- Product development
- Production design
- CAD
- FEM
Capabilities
-Senior Engineering Staff-
V-22 TiGr Engine Nacelle Door
Prediction of Cracking in Composites
FEM Model and Photo

Three Stringer Compression Specimen
Capabilities
Design & Fabrication

- Tool design & fabrication (including composite tooling)
- 6’ dia. x 15’ research autoclave, 450°F - 150 psi
- Sandwich structures, graphite, glass, Kevlar, thermoplastic & thermoset parts
- High modulus graphite, net OD & ID tubes
- Prototype & component design
- Process development & optimization
- Product development
- 5 axis, 24,000 rpm, (12’ x 5’ x 36” envelope) composite machining
Our engineering group is well experienced in designing containers that specifically meet weight, shock, durability, and environmental isolation requirements.
Engineered Container Systems
Container Systems
Advanced Reconfigurable Container
“ARC”
Container Systems
Advanced Reconfigurable Container
"ARC"
Engineered Containers
JASSM Cruise Missile Container
Engineered Containers
Engineered Containers
Engineered Containers
Engineered Containers
Engineered Containers
Engineered Containers
Engineered Containers
Bell V-22 TiGr Nacelle Door
Grid Stiffened VARTM Panel
Fabrication of Aircraft Parts

Fabrication Types:

- Skin stringer
- Sandwich
- Hybrids
- Thermoplastic Extrusion
- Thermoset Extrusion
- Thermoplastic Pultrusion
- Thermoset Pultrusion
- RTM skin stringer
Prototype and Production Parts

Fabrication:

- Fixed & rotary wing aircraft and satellite hardware & parts
- Master model making
- Reusable and disposable mandrels
- Tubes, clips, ducts, and structural shapes

Repair: parts, components, and structures
Prototype and Production Parts

Fairchild Dornier Envo 7

Soloy Corp Engine Nacelle

Raytheon Hawker 800
Boeing 747 Winglet Fabrication
Prototype and Production Parts
Prototype and Production Parts
EAGLE 600
Conceptual Design Program
Internal Layout – Options

- Lycoming HIO-360-D1A

- Continental IO-360D
Layout

Units = Inches
Positive Head Moment

- Choices considered were a fully articulated 3-bladed hub or 2-bladed teetering hub with offset elastomeric flapping hinges and hub spring
- To reduce hub complexity, use 2 blades - resulting hub design is similar to that successfully used on Bell 222
Prototype and Production Parts
Prototype and Production Parts
Large Components with Integrated Doublers
6’ x 15’ Autoclave
150 PSI - 500°F

60” x 140” INVAR Tool for Low CTE Panel Fabrication
Aluminum Sandwich Satellite Corner Wall
UHM 8552 / Korex 127” X 60” Sandwich Panel for Satellite Ribs

Titanium / Graphite Hexapod Brackets

Large Flat Panels using INVAR Tooling
Fabrication of Specialized Aerospace Parts

Thermal, EM and Structural Solutions Example:

- Satellites (Extreme Environments)
- Thermal Management, & EM Shielding
- Structural Stability (CTE, Specific Stiffness)
- Military Electronics (Extreme Environments, Low T & EM Tolerance)
- Thermal Management
- Extreme EM shielding, Targeted EM absorption
- Structural Stability (CTE, Specific Stiffness)
Low Cost Metal Matrix Composites

- Lower CTE
- High Strength, Stiffness, Fracture
- Functional Gradient Properties in Castings
- High % Percentage Reinforcement
Laminated TiGr Metal Composites

- Design Tools/Data
- Dry Surface Preps on Metal Surfaces
- Chrome Cathodic arc ≈ 700Å

- Prototype Parts
  - C-17 Tear Straps
  - HSCT Fuselage Structure
  - Bell V-22 Nacelle Door
  - 777-200 Fuselage Stringers
Aerospace Machining example:
Intec has produced several major components for the Boeing Joint Strike Fighter prototype forebody. These parts include the air inlet duct pivots (Bullnose), nosewheel landing gear retract arms, and several large, high tolerance aluminum grid avionics trays.
Metal & Composite Machining
Flight Hardware -737-757-767- Landing Gear Doors
Metal & Composite Machining
Precision Core Machining
Integrated Technologies, Inc.
UW-FAA Center of Excellence on Advanced Materials.

Fabrication

Advanced Materials

Engineering  Machining  Testing