ATA Engineering, Inc. | High Value Test-Driven and Analysis-Driven Engineering Design Solutions

CAPABILITIES

ATA ENGINEERING, INC. FUNCTIONAL CAPABILITIES

ATA Engineering, Inc., (ATA) is an employee-owned small business that has been providing engineering services in the areas of product design, structural dynamics, thermal analysis, aeroelasticity, acoustics, software development, computational fluid dynamics, structural mechanics, training, and testing since 1977. During that time we have gained a reputation for excellence in the engineering community and have had the opportunity to work on a very wide range of products, including military and commercial aircraft, satellites and interplanetary spacecraft, launch vehicles, transportation vehicles, mining equipment, entertainment-related rides and equipment, and a wide variety of consumer products.

Our particular expertise focuses on structural dynamic analysis, testing, and nonlinear transient dynamics, including specialized cases such as coupled loads and vibroacoustics. This expertise has resulted in ATA being a critical team member in the design and analysis of many highly engineered products, which have included launch vehicles and satellites for all major US aerospace companies; numerous military aircraft; missile systems; roller coasters and simulators for international theme parks; rail, road, and sea transportation equipment; industrial machinery; homeland security hazard detection equipment; and electronic and commercial products ranging from disk drives to robotics to medical implants.

ATA is a leading provider in the application of advanced computer-aided engineering (CAE) tools to drive efficient, optimized product development through test and analysis. Our engineering staff are experts in the use of a wide variety of software tools including NX, I-deas, SolidEdge, and SolidWorks for design; NX, I-deas, Nastran, Abaqus, ANSYS, and Femap for analysis; and I-deas for Test and MATLAB for test. In addition, we are skilled in the development of customized software and methods to further optimize design, analysis, test, and data visualization processes.

ATA is headquartered in San Diego, California, with offices in Los Angeles; Herndon, Virginia; Lakewood, Colorado; Sammamish, Washington; and Huntsville, Alabama. We employ a regular, full-time staff of more than 130. More than 110 of our staff are engineers, the majority of whom have advanced degrees.

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Structural and Dynamic Analysis

- Loads determination
- Assessment of static and dynamic load effects
- Test-verified finite element model development
- Detailed stress
- Durability
- Random, sine, and shock
- Aeroelastic
- Coupled loads

Testing

- Ground vibration (modal)
- Operational
- Environmental
- Strain, acceleration, thermal, displacement, and force measurements
- Drop, shock, and pyroshock measurements
- Rotating and reciprocating machinery
- Acoustics
- Accelerated fatigue testing
- Data postprocessing and analysis
- On-site, real-time operational strain testing for structural endurance assessment

Product Design

- Conceptual and detailed
- Requirements, specifications, and drawing development
- Review and verification
- Optimization
- Prototype development
- Project management

Vibroacoustics

- Random vibration and acoustic environments definition
- Data processing and analysis
- Liftoff and aeroacoustics for launch vehicles
- Subsonic and supersonic flight interior noise prediction
- Detailed structural-acoustic design and design of acoustic blankets
- Statistical energy analysis for wide-bandwidth system-level design

Computational Fluid Dynamics

- Flow simulation and visualization
- Fluid-structure interaction
- Advanced methods development
- Structural optimization

Thermal Analysis

- System-level thermal analysis and design
- Component heat management
- Board-level and chip-level thermal analysis
- Orbital heating

Mechanism/Nonlinear Dynamic Analysis

- Assembly, operation, and handling
- Animatronics
- Deployment and stage separation

Robotics and Controls

- Control of dynamical systems
- Pointing and control of structure-borne optical systems
- Control-structure interaction
- Implementation in traditional PLCs or advanced embedded controllers
- Application to autonomous ground and air vehicles

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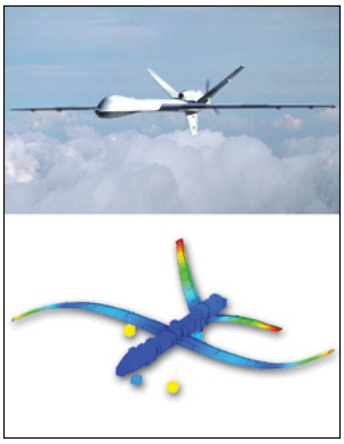

CUSTOMERS INCLUDE:

Aerojet, BAE Systems, Boeing, Coleman Aerospace, General Atomics Aeronautical Systems Inc., Lockheed Martin, NASA, Northrop Grumman, Orbital Sciences Corporation, Pratt & Whitney, Western Digital

PRODUCT EXPERIENCE INCLUDES:

Airframes, rocket engines, launch vehicles, missiles, satellites, spacecraft, reflectors, consumer and military electronics, heavy machinery, roller coasters, manufacturing equipment

CODES UTILIZED:

Abaqus®, Attune™, Brüel & Kjær Test for I-deas, MATLAB®, MSC.Nastran™, NX Nastran, Siemens I-deas® NX, VA-One, ZONA/ZAERO®

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ATA ENGINEERING, INC.®

Dynamic Analysis and Test-Analysis Correlation

OVERVIEW

Many structures must survive severe dynamic environments including transient, sinusoidal, random, and acoustic excitation. ATA has extensive experience in performing structural dynamics analysis to predict dynamic loads and responses. We have a variety of software tools including Siemens I-deas NX, Nastran, and MATLAB to analyze different environments. We are knowledgeable on the information contained in many dynamic-response specifications and requirements including the full range of military and NASA standards.

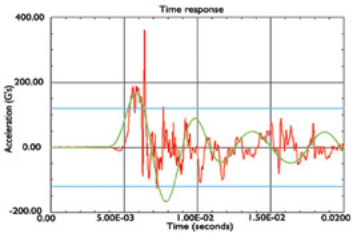
ATA recommends that when feasible, a test-verified finite element model be developed as this is the only way to guarantee that the model is accurate. The accuracy of the model can be critically important for use in coupled loads, transportation, control system, and other dynamic analysis. Modal testing provides a measurement of the actual dynamic characteristics of a structure. The finite element model is then adjusted to provide better agreement between the predicted (analysis) and actual (test) results. This process is usually called test-analysis correlation or model updating.

ATA has developed methods and software programs, including Attune, to efficiently perform model updating and the many correlation checks that are part of this process. The test-analysis model (TAM) mass matrix, produced during a pretest analysis, is valuable for performing many of these checks including orthogonality, cross-orthogonality, effective mass, and energy distribution. We have also developed automated procedures for optimally locating both exciters and sensors for a modal test. I-deas can also be used for computing orthogonality and modal assurance criterion (MAC) calculations.

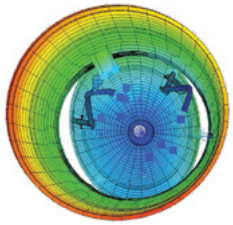
With a correlated finite element model, the quality of dynamic analysis results improves dramatically. In addition to the considerable experience in the area of flutter and divergence, ATA has evaluated the full gamut of shock and vibration loads including those due to the following:

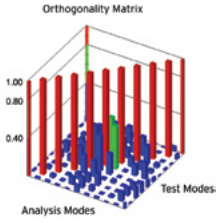
- Sea, air, rail, and road transportation
- Lift and drop
- Wind and wave
- Launch, engine ignition, and stage separation

Comparison of measured and predicted acceleration for drop event provides critical design information



Correlation of test and analysis data provides high levels of confidence in analytical predictions for sophisticated aerospace products





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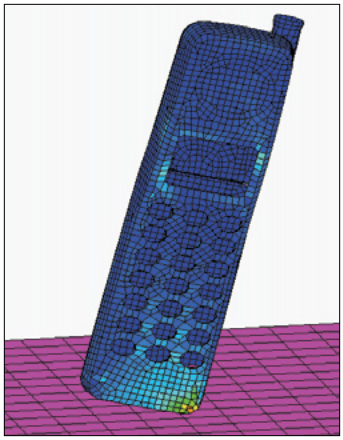

CUSTOMERS INCLUDE:

Aerojet, ATK, BAE Systems, Boeing Satellite Systems, InVision, Kistler, Martinez & Turek, Pratt & Whitney, Premier Rides, BMT Scientific Marine Services

PRODUCT EXPERIENCE INCLUDES:

Launch vehicle and airframe structures, rocket engine components, reflectors and antennae, theme park rides, flight simulators, industrial machinery, tooling fixtures, pump and valve housings, consumer and military electronics

CODES UTILIZED:

Abaqus®, ANSYS®, BOSOR, Siemens I-deas® NX, Siemens Femap®, NASA/FLAGRO, MATLAB®, MATHCAD®, MSC. Nastran™, NX Nastran

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ATA ENGINEERING, INC.®

Shock/Drop and Pyroshock

ATA SHOCK TEST EXPERIENCE

ATA has over 20 years of experience measuring and analyzing shock-type events. For these tests, accelerometers, strain gages, and pressure transducers are used to assess structural component loads due to high-speed transient events. The test data are then used in developing design specifications and assessing structural performance characteristics.

PYRO-SHOCK

ATA has provided pyro-shock measurements for several major aerospace companies. These are typically events dealing with separations of launch vehicles, which can subject structures to extreme structurally and acoustically borne acceleration inputs. Peak accelerations as well as shock response spectra allow assessment of these environments.

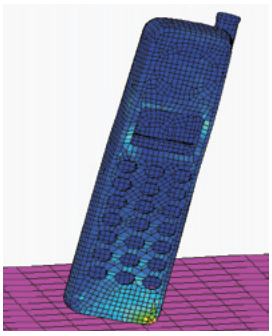
DROP AND IMPACT TESTING

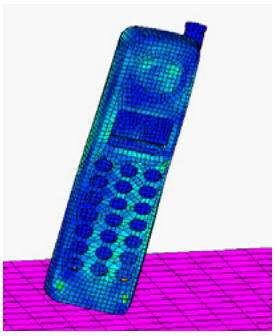
Environmental-type drop and impact testing has been performed for both aerospace and commercial customers. These tests are used to validate transportation equipment and packaging of sensitive electronics components. Peak accelerations are measured as well as structure displacements to evaluate loads transmitted and determine if an impact event will occur under specified conditions. Some structures tested by ATA include satellite transportation systems, military munitions, hand-held electronic devices, and sporting equipment.

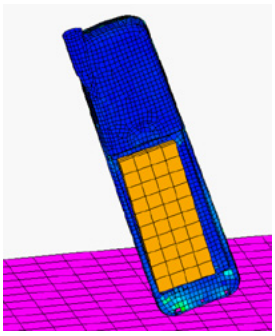
TEST CAPABILITIES

- Mobile test equipment allows for fast setup and testing at customers sites
- High-speed data acquisition rates to capture pyro-shock events
- Shock accelerometers (4.2 grams and 50,000 g peak levels)
- Over 100 channels of strain conditioning
- Microphones and pressure transducers
- Electrodynamic shaker for performing mechanical shock

▼ Drop testing simulation helps validate packaging of sensitive electronics components in a wide range of products







CUSTOMERS INCLUDE:

AK Steel, Alcoa, Bosch, Caterpillar, Cooper Tire, Cummins Diesel, Delphi, John Deere, General Motors, Ford Motor, Harley-Davidson, Hyundai, Mercury Marine, Mitsubishi Polyester Films, MTS, Visteon, Renault, TWR, Allied Signal, Metaldyne, GKN, Dana, NASA, Teldix and National Renewable Energy Lab, Solar Turbines, FMI, FLSmidth

PRODUCT EXPERIENCE INCLUDES:

Diesel and gas-powered engines, mining and mineral processing equipment, consumer and aerospace electronics, electric motors, medical equipment

CODES UTILIZED:

B&K Pulse Reflex, MATLAB, IMAT, ROTATE, ROTATE PLUS

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ATA ENGINEERING, INC.®

Rotating and Reciprocating Machinery Testing

OVERVIEW

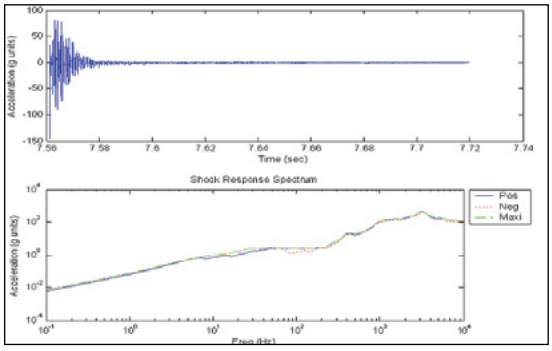
Using a broad range of software, ATA applies testing and analysis of rotating and reciprocating machinery to a broad range of industries from automotive to defense. ROTATE PLUS is in wide use for analyzing noise and vibration from time waveform and tachometer (or other machine speed) signals. ROTATE PLUS, in addition to ATA's other software suites, allows our test engineers to postprocess vibration and other types of data from many different data recorders.

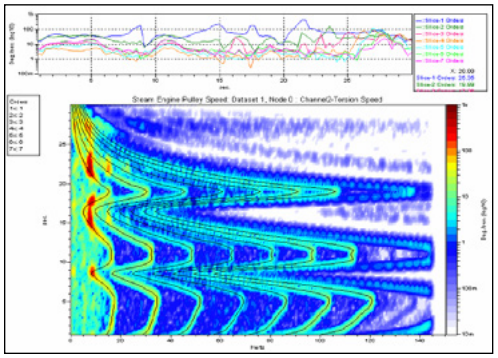
Continuing the work of Dr. Håvard Vold, a recognized leader in the sound and vibration analysis field, ATA applies the same upfront design-test-analysis expertise to rotating equipment solutions for clients as it does to other mechanical engineering challenges.

Applications include the following:

- Characterizing individual vibration frequencies in hertz, RPM, or orders
- Characterizing resonances
- Analyzing dynamic fatigue
- Analyzing torsional vibration with or without the use of slip rings, shaft-mounted transducers, or telemetry
- Identifying problems in variable-speed machinery, particularly when the speed changes rapidly or over a large range
- Troubleshooting intermittent problems that may require hours of data recording
- Identifying early-stage bearing and gearbox defects
- Creating a machine speed (RPM) history from vibration data alone (without a tachometer signal)
- Separating order-related vibrations from non-order-related vibrations
- Identifying problems in crowded, noisy signals from gearboxes and transmissions with closely spaced and crossing orders
- Diagnosing machinery when there is a noisy tachometer signal or no tachometer signal at all
- Performing advanced diagnosis using data from sensors away from the machinery—accomplished by detailed evaluation of time waveform data with powerful analysis tools
- Creating impressive plots and tables of data to use in reports and presentations

▼ ROTATE PLUS allows sophisticated postprocessing of test data to provide greater insight into product performance





CUSTOMERS INCLUDE:

Aerojet, ATK, BAE Systems, Boeing Satellite Systems, Chance Morgan, InVision, Martinez & Turek, Pratt & Whitney, Premier Rides

PRODUCT EXPERIENCE INCLUDES:

Launch vehicle and airframe structures, rocket engine components, reflectors and antennae, theme-park rides, flight simulators, industrial machinery, tooling fixtures, pumps and valves, electronics, battery cell casings

CODES UTILIZED:

Abaqus®, ANSYS®, BOSOR, Siemens I-deas® NX, Siemens Femap®, NASA/FLAGRO, MATLAB®, MATHCAD®, MSC. Nastran™, NX Nastran

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ATA ENGINEERING, INC.®

Strength, Optimization, and Durability Analysis

OVERVIEW

ATA performs structural analysis using advanced finite element analysis (FEA) and traditional handbook methods. We develop, analyze, and display finite element models and results using Siemens I-deas® NX Series pre- and post-processing and I-deas Model Solution Linear and Nonlinear solvers. For specialty applications, we use additional software tools including Nastran, Abaqus®, ANSYS®, and BOSOR. We evaluate structural endurance using the Siemens I-deas Durability™ module as well as traditional methods. Detailed stress analysis of fastener loads, pullout, bearing, and other factors is performed using established design handbooks augmented by semi-automated procedures including MATHCAD® and spreadsheets.

ATA is expert in the following areas:

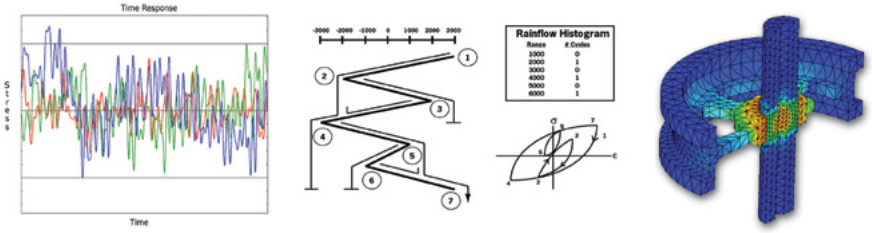
- Strength analysis of structures
- Structural optimization
- Fatigue analysis of welded structures

ATA staff have extensive experience predicting stresses in both metallic and composite structures. Nonlinear geometric and material effects can also be considered. For highly nonlinear problems, ATA uses Abaqus/Standard or Abaqus/Explicit to include effects such as creep, contact, large displacements, and multibody dynamics, and to simulate manufacturing processes such as rolling and forming.

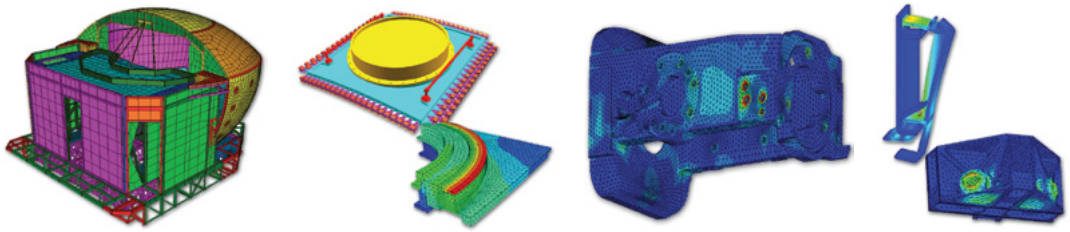
Fracture mechanics analysis of metallic structures is performed using NASA/FLAGRO. Cyclic stress magnitude and orientation is recovered from an FEA analysis of the structure and input into FLAGRO where this information is used to predict crack growth and stability and maximum-allowable-initial-crack size based on simplified crack models.

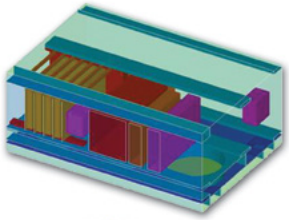
Optimized structures provide significant benefits including low material cost and maximum system performance. ATA performs structural optimization to minimize structural weight subject to frequency, displacement, and stress constraints. We use Siemens I-deas optimization for statics, buckling, and modal analysis, and Nastran or Abaqus for specialty applications. ATA can also advise on design and manufacturing approaches to further optimize performance and manufacturability.

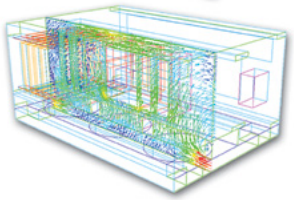
Stress or strain time histories may be used to determine the damage to, and durability of, components under given duty cycles



ATA performs strength evaluation and optimization for products ranging in size from flight simulators to detailed subcomponents







CUSTOMER INCLUDE:

AASC, Aerojet, Ball Aerospace Corporation, Boeing Satellite Systems, Ceradyne, Cymer, Lockheed Martin, NASA, Nokia, Sandia National Labs, Seagate, Trex Enterprises, Vanguard Composites Group

PRODUCT EXPERIENCE INCLUDES:

Launch vehicles, satellites, rocket engines, reflectors, spacecraft, disk drives, laser systems, optical platforms, consumer and aerospace electronics, chemical reactors, electric motors, medical equipment

CODES UTILIZED:

Siemens I-deas® NX Series TMG™ and ESC™, SINDA, Thermal Desktop, TRASYS™, NEVADA™

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ATA ENGINEERING, INC.®

Thermal and Fluid Analysis

OVERVIEW

Mechanical problems often occur when a system becomes too hot or too cold or is continuously cycled through a large temperature range during its lifetime. Typical problems include equipment failure, mechanical distortion, and structural failure. ATA has extensive experience in performing thermal analysis of aerospace and electronic systems. Our primary analysis tools are the TMG™ and ESC™ modules of Siemens I-deas® NX Series, which have capabilities for conduction, convection, and radiation problems. ATA has experience in defining the solar radiation environment and orbital mechanics for satellites and other orbiting systems. For ground-based systems, we analyze electronic systems with forced or natural convection cooling.

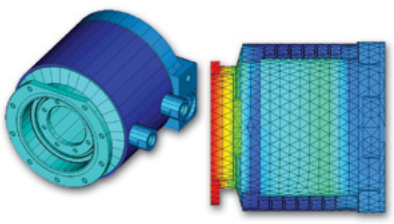
We also use SINDA, TRASYS™, and NEVADA™ when necessary for specialty analysis and legacy compatibility. We can convert TMG data to and from these software packages as necessary.

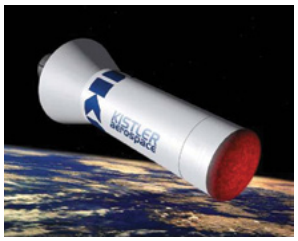
Additionally, we have commercial and in-house code that we use to map data, such as spatially varying heat flux on a surface, from other codes to our thermal models. We can also create user-subroutines to handle complex heating, such as chemical reactions, or to simulate active thermal-control systems. Finally, we can map temperatures from our models to structural models for use in thermal distortion or thermal stress analysis.

ATA provides thermal and coupled fluid-thermal analysis and design support at a variety of different levels depending upon the application. This support includes the following:

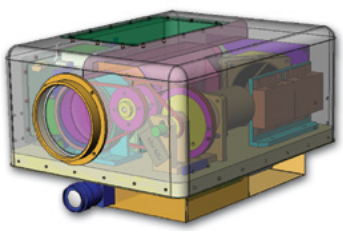
- Chip-level thermal analysis
- Board-level thermal analysis
- Component heat management
- System-level thermal analysis
- Orbital heating

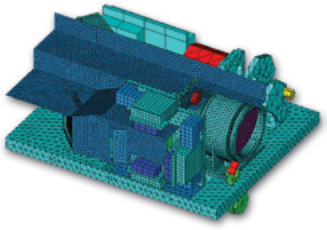
▼ ATA has provided thermal and fluid analysis services for products ranging from small motor casings to launch vehicles

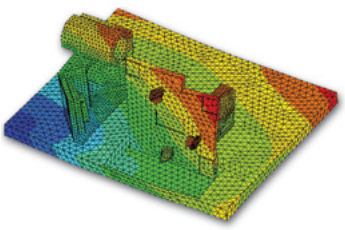


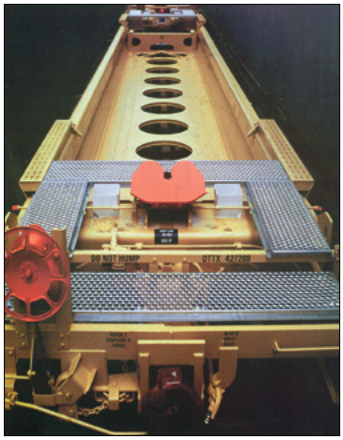


▼ Coupled fluid-thermal analysis of sensitive optical systems allows design of cooling systems to minimize distortion









CUSTOMERS INCLUDE:

Gunderson, Ling Electronics, Kistler Aerospace, Martinez & Turek, NASA, USAF

PRODUCT EXPERIENCE INCLUDES:

Intermodal stackable railcars, launch-vehicle payload adapters, electromagnetic shakers, precision machinery, antenna support structures, launch-vehicle fuel tanks, motion simulators

DESIGN CODES UTILIZED:

AutoCAD®, Siemens I-deas® NX, Solidworks®, Solid Edge®, Unigraphics®

ANALYSIS CODES UTILIZED:

Abaqus®, Siemens I-deas® NX, Siemens Femap®, NX Nastran, MSC.ADAMS™, MSC.Nastran™

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ATA ENGINEERING, INC.®

Product Design and Prototyping

OVERVIEW

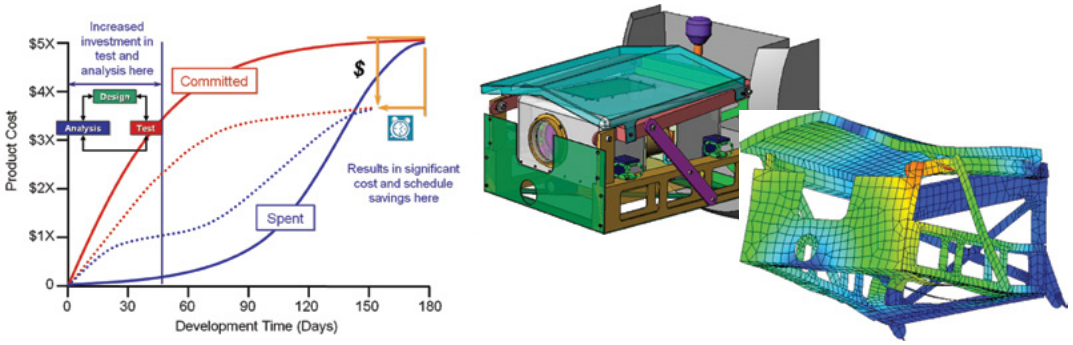
ATA provides design services to support clients with their product development processes. For the last thirty years, our staff has worked with companies to help get their products to market faster. Our experience with the mechanics, materials (metal and composite), and manufacturing aspects of product design help our customers reduce the number of prototypes and mechanical tests necessary to arrive at a high-quality, reliable, and cost-effective product.

ATA is able to achieve significant savings in time and cost without negatively impacting quality through the early use of an analysis- and test-driven design process. Through early application of analytical techniques, a detailed understanding of the requirements can be developed. Through this analysis, the product specification can be turned into detailed design guidelines that help the designer get it right the first time. The early understanding gained from analysis allows design changes at a time when the commitment to the design is smaller and modifications are less costly in terms of time and expense.

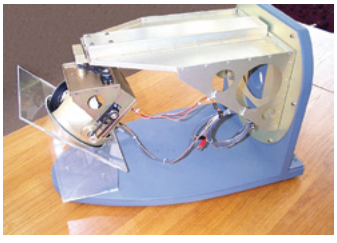
The analysis can then continue as the design develops, guiding the design process and refinement. The application of analytical design-optimization techniques often refines the design and effectively and efficiently achieves the design objectives. By the time a detailed design has been developed and prototypes are built, the product performance is well understood.

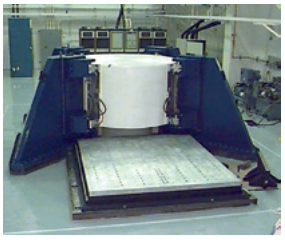
Companies often have the need to develop new product prototypes but do not have the time, facilities, or experience. We work closely with the client to engineer the product, produce prototype drawings, and deliver prototype hardware. ATA has strong relationships with several manufacturing companies that can produce precision prototypes for metallic or composite products for a very wide range of dimensions. This often can be accomplished in less time than if done in-house due to the unique engineering environment and dedicated personnel at ATA. In the majority of cases, all product rights and patents remain with the client.

▼ ATA's analysis- and test-driven approach to product design reduces cost and schedule and helps get the product right the first time



▼ Products designed range in size and use from compact optical systems packaging to satellite shakers to launch-vehicle fuel tanks





CUSTOMERS INCLUDE:

ATK, Ball Aerospace, Boeing, Embraer (Brazil), General Atomics Aeronautical Systems Inc., KAI (Korea), L-3, Lockheed Martin, NASA, Northrop Grumman, Orbital Sciences Corporation, Pratt & Whitney, Solar Turbines, Raytheon

PRODUCT EXPERIENCE INCLUDES:

Commercial and military airframes, rocket engines, launch vehicles, missiles, satellites, spacecraft, reflectors, consumer and military electronics, heavy machinery, roller coasters, precision equipment

CODES UTILIZED:

Siemens I-deas® NX, IMAT™, Test for I-deas software, MATLAB, B&K Pulse Reflex®

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ATA ENGINEERING, INC.®

Modal Testing

OVERVIEW

ATA is the leading independent company for performing modal survey tests. We have performed modal and dynamic testing for more than 35 years. We pioneered the use of random excitation for modal testing and extended the method to include multi-shaker random testing, patented multi-shaker Multi-Sine[1] testing, and alias-free polyreference modal parameter estimation. We have unsurpassed experience in modal testing of aerospace and industrial systems including large-scale tests for aerospace systems, using over 500 accelerometers and nine shakers simultaneously. The aerospace structures we have tested include aircraft, space launch vehicles, rocket motors, and satellites. Other modal tests we have performed include surface-effect ships, robotic figures, propeller blades, generator sets, fixtures, and countless others. An ATA modal test program can include all of the following tasks:

- Pretest analysis using a finite element representation of the structure to generate a test-analysis model (TAM). The TAM is used to determine the ideal number and location of accelerometers and exciters and a mass matrix for orthogonality checking of test mode shapes.
- A detailed test plan is developed during the test planning task.
- During test execution, ATA will generally use a combination of multiple-input-random, multiple-input Multi-Sine, and impact excitation methods to define the modes of interest. “Quick look” reports summarizing results are typically presented the same day.
- A final correlation task to update the finite element model to achieve agreement with modal test results. An application such as ATA’s own Attune is used for this purpose.

All of the modal testing equipment is portable and is typically transported to the customer’s facility for on-site modal tests of large systems. ATA test equipment includes exciters, accelerometers, amplifiers, data-acquisition systems, and analysis computers. Many other pieces of equipment required to perform a modal survey, including force gages, oscilloscopes, meters, switching systems, signal generators, shaping filters, cables, and terminals, are also part of ATA’s extensive inventory.

All ATA equipment is configured for remote testing and is commonly shipped via air or truck commercial carrier. In addition, ATA has a 1,800 ft^2 laboratory for in-house testing.

▼ ATA test equipment is configured to be highly mobile to allow testing at customer sites

▼ ATA is widely recognized as the leading independent aerospace modal testing company and supports customers all over the world

1 U.S. Pat. No. 8,281,659

CUSTOMERS INCLUDE:

ATK, Ball Aerospace, Boeing, Embraer (Brazil), General Atomics Aeronautical Systems Inc., KAI (Korea), L-3, Lockheed Martin, NASA, Northrop Grumman, Orbital Sciences Corporation, Pratt & Whitney, Solar Turbines

PRODUCT EXPERIENCE INCLUDES:

Commercial and military airframes, rocket engines, launch vehicles, missiles, satellites, spacecraft, reflectors, consumer and military electronics, heavy machinery, roller coasters, precision equipment

CODES UTILIZED:

Siemens I-deas® NX, IMAT™, B&K Test for I-deas software, MATLAB®

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ATA ENGINEERING, INC.®

Modal Testing Experience

RECENT MODAL TESTS INCLUDE:

PROGRAM	CLIENT	NO. OF MODES	TEST DAYS	TEST ARTICLE TYPE	# CHANNELS
G500 GVT and SMI	Gulfstream	100+	6	A-C	475
Q400 pre-mod	L-3 Communications	35	3	A-M	190
X-47B UCAS-D	Northrop Grumman	65	5	A-U	240
Bigelow Expandable Activity Module (BEAM)	Bigelow Aerospace	10	4	SAT	95
Airtractor Modal Troubleshooting	Airtractor	20	4	A-C	24
G500 acoustic transmissibility	Gulfstream	n.a.	3	A-C	240
U-Frame	Boeing	5	1	O	60
Omni Antenna	Boeing	10	1	SP	24
Dreamchaser rocket motor	Sierra Nevada Corporation	6	1	O	24
Improved Gray Eagle Fault Tolerant Tails	General Atomics ASI	8	2	A-U	80
E-6B pre-mod	L-3 Communications	30	5	A-M	230
NOVA satellite DTV II	Millennium	35	3	SAT	160
NOVA satellite DTV I	Millennium	45	4	SAT	180
ALPHA frame	ATK	60	2	SAT	145
Beech 350	L-3 Communications	30	4	A-M	145
Predator XP	General Atomics ASI	90	3	A-U	190
MQ-9 with fuel tank pods	General Atomics ASI	178	4	A-U	156
MQ-9 Block 5 with wing tips	General Atomics ASI	54	2	A-U	145
MQ-9 with DDR pod	General Atomics ASI	27	2	A-U	104
WB-57F N927	NASA-JSC	30	2	A-M	137
Gray Eagle Fault Tolerant Tails	General Atomics ASI	36	2	A-U	128
Avenger AC2 with Tailsman and SP1 pods	General Atomics ASI	66	2	A-U	96
Orion	Aurora	50	4	A-U	209
Tenacious Launch Dispenser	Orbital	10+	1	SAT	64
BAMS delta configuration	Northrop Grumman	60	4	A-U	230
Modified Boeing 747SP Aircraft GVT	L-3 Communications	60+	5	A-C	260
MQ-9 GBU-48	General Atomics ASI	50	2	A-U	150
MAD	Lockheed Martin Skunk Works	150+	4	A-U	120
SM-3	Raytheon	100+	12	LV	256
GPS-III Satellite	Lockheed Martin	40+	7	SAT	200
APKWS modal	BAE	30+	2	LV	40
LADEE satellite	NASA Ames	35	2	SAT	160
Avenger	General Atomics ASI	10	2	A-U	32
MQ-9 DB-110	General Atomics ASI	50	3	A-U	120
Avenger	General Atomics ASI	10	2	A-U	32
Gray Eagle 1760	General Atomics ASI	150	5	A-U	200
AP610	Northrop Grumman	60	5	A-U	300
MQ-9 de-ice	General Atomics ASI	45	2	A-U	150
MQ-9 Reaper Harvester UAV GVT	General Atomics ASI	45	2	A-U	150
Improved Gray Eagle a/c tails	General Atomics ASI	42	2	A-U	55
Jordan Light Gunship Weapon	ATK	110	3	O	120
MQ-9 Reaper Gorgon Stare II	General Atomics ASI	45	2	A-U	100
BAMS	Northrop Grumman	60	4	A-U	230
Modified Boeing 747SP Aircraft GVT	L-3 Communications	61	5	A-C	240
P-3C aircraft GVT with store	L-3 Communications	180	8	A-M	230
P-3C aircraft GVT	L-3 Communications	37	5	A-M	200
AR-SAT Modal Test	INVAP S.A.	38	10	SAT	202
Modified EC-130H Aircraft GVT	L-3 Communications	108	4	A-M	191
MQ-1B Griffin launcher	General Atomics ASI	66	3	A-U	120
MQ-9 dual wing TAC pods	General Atomics ASI	83	3	A-U	139
Avenger a/c 2 GVT IWS	General Atomics ASI	110	3	A-U	196
Predator B Selex pod	General Atomics ASI	37	2	A-U	100
Improved Gray Eagle a/c 1	General Atomics ASI	114	5	A-U	208
Phantom Eye GVT support	NASA DFRC	26	2	A-U	184
MQ-9 Block 1 ASIP-2C	General Atomics ASI	85	3	A-U	166
Avenger a/c 2 GVT	General Atomics ASI	55	9	A-U	226

A-C = Commercial Aircraft, A-M = Military Aircraft, A-U = Unmanned Aircraft LV = Launch Vehicle,
SAT = Satellite, SP = Small Payload, O = Other

PROGRAM	CLIENT	NO. OF MODES	CHANNEL COUNT
Sofia 747 Telescope GVT	L-3 Communications	300+	380
Trent 1000 747	L-3 Communications	50	200
ERJ170	Embraer	40+	415
G-V Airplane	Gulfstream	30	232
L-1011 Airplane (2)	Marshall Aerospace	40+	100+
MD-90 Airplane	Boeing (Douglas)	50+	120
Convair Stretch 580	Flightcraft	30+	80+
MD-11 Airplane	Boeing (Douglas)	100+	250+
Dash 8 Airplane (2)	de Havilland	60	100+
MD-87 and UHB Airplanes	Boeing (Douglas)	40	190+
G-IV Airplane	Gulfstream	30	150+
Boeing 707 Airplane	Tracor	30	100+
Douglas DC-8 Airplane	Tracor	30	100+
C130 Aircraft propeller mod	Snow Aviation	20+	150
C-5 Aircraft	LM Georgia	50+	256
YSH-60F VTDP Helicopter	Piasecki	30+	100
C130 Aircraft	Snow Aviation	20+	110+
EC130J Aircraft	LM Palmdale	30+	80+
F117A	LM Palmdale	15+	50+
T-50 Trainer/Fighter	Korean Aerospace	50+	275+
JSF X-32 CTOL & CV Aircraft (2)	Boeing	50+	300+
JSF X-35 CTOL & CV Aircraft (2)	LM Palmdale	50+	300+
JSF Aircraft Control Surfaces	LM Skunk Works	10+	20+
F117A	LM Skunk Works	10	50+
F/A-18 E/F Fighter Aircraft	Boeing (Douglas)	100+	300+
C-17 Airplane	Boeing (Douglas)	100+	406
Tucano Fighter with/without Stores	Shorts	30+	100
C-101 Trainer/Light Attack Aircraft	CASA	50+	100+
T-46 Trainer Aircraft (4)	Fairchild	30	80+
P-3 AEW Airplane	LM Burbank	30	100+
Predator A Stores	General Atomics/ASI	50+	160
Predator A Ventral Fin	General Atomics/ASI	40+	70
RQ-4B UAV	Northrop Grumman	28+	238
ALTAIR UAV with Pod	General Atomics/ASI	20+	60
RQ-8B VTUAV	Northrop Grumman	20+	201
Predator B Tail	General Atomics/ASI	10+	64
Predator B UAV	General Atomics/ASI	300+	200
Predator B Meridian B Pod Only	General Atomics/ASI	20	90
Predator B Meridian B with Pod	General Atomics/ASI	48	140+
BQM	Northrop Grumman	30+	100
Altair BAMS Stores	General Atomics/ASI	15	72
Aircraft Test Vehicle	LM Palmdale	20+	80+
Hunter/Killer UAV	General Atomics/ASI	54	168
ALTAIR UAV	General Atomics/ASI	73	165+
RQ-8A UAV	Northrop Grumman	20+	195
UCAV	NASA Dryden	30+	64+
Predator, Predator B UAV	General Atomics/ASI	30+	230
JASSM Air Vehicle	LM Palmdale	10+	84
JASSM Air Vehicle	LM Skunk Works	10+	60+
Darkstar UAV	LM Skunk Works	25+	150+
Tier II+ Global Hawk UAV (2)	Northrop Grumman	90+	290+
Darkstar UAV	LM Skunk Works	25+	80+

PROGRAM	CLIENT	NO. OF MODES	CHANNEL COUNT
1/3 Scale Module	Bigelow	5	128
Opal Structure	ATK	3+	30
RSP1SS Equipment Rack	Johnson Engineering	10+	112
Super Guppy ISS Transport	Johnson Engineering	10+	87+
Satellite Propellant Tank (2)	Wyle/PSI/TRW	10+	50+
Space Station Mobile Transporter	Wyle/Astro Aerospace	15+	204
ISPR (Space Station) Adapter	Boeing Hunstville	20+	87
Spacehab Rack	Boeing Hunstville	15+	143
Shuttle SLS-1 Experiments (22)	NASA/LM Houston	15	100+
SVMV Petal	Lockheed Martin	100+	140
Spacecraft Component	Orbital Sciences	13	120
Opto-Mechanical Assemblies	Kodak	15	140+
P1205 Spacecraft	Spectrum Astro	13	185+
Mars Reconnaissance Orbiter	Applied Aerospace Structures	36	40+
NFIRE Spacecraft	Spectrum Astro	14	185
Deep Impact Spacecraft	Ball Aerospace	20+	193
ESPAD	Oceaneering	20+	71
Mars Exploration Rovers	JPL	20+	50+
STAR2 Satellite	Orbital Sciences	30+	195+
Astrolink Antenna	Northrop Grumman	30+	192
BSAT-2 Satellite	Orbital Sciences	15+	145
P-91 Satellite	Boeing (Rockwell)	20+	231
Indostar Satellite	Orbital Sciences (CTA)	48	162
CSI Evolutionary Model	NASA Langley/LM	40+	103
ASTREX	Phillips Lab	25+	126
Space Station Models (2)	NASA Langley	10+	100+
Starlab POB	LM Sunnyvale	50+	140+
FltSatCom Satellite	Northrop Grumman	33	90+
Galileo Satellite	JPL	27	100+
CMCM	Orbital Sciences	10+	80
NFIRE Fairing	Orbital Sciences	22	120
SRALT Launch Vehicle	Orbital Sciences	30	128
Thaad IGA	BAE	20	12
SSST Target	Orbital Sciences	32	60
Hyper-X Pegasus Fin	Orbital Sciences	10	20
RL10B-2 Engine for Delta 4	Pratt and Whitney	30+	150
SRALT	Coleman Aerospace	40+	115
LRALT	Coleman Aerospace	20+	147
NMD EKV	MRC	10+	40+
NMD Stage 2-3 Pyroshock	UT/CSD	N.A.	117
MBRV-I, MBRV-II	Coleman Aerospace	10+	90
X-38 ASE Shuttle Cradle	ABB	10+	80+
RL10B-2 Engine for Delta 3	Pratt and Whitney	30+	200
X-34 & L-1011 Carrier Aircraft	Orbital Sciences	350+	240+
Castor IVA and 120 SRMs	Thiokol	20+	261
RL10B-2 Delta 3 Nozzle	Pratt and Whitney	10+	150+
Pegasus Launch Vehicle	Orbital Sciences	25+	180+
Taurus Launch Vehicle	Orbital Sciences	7	80+
Atlas II Payload Fairing (2)	LM San Diego	20+	108
Shuttle Orbiter Body Flap (3)	NASA-JSC	6	50+
Commercial Titan DPCA	LM Denver	33	180+
Transfer Orbit Stage	LM Denver	20	140+
Small ICBM Stages I,II, III	Thiokol, Aerojet	26–35	90+
Titan—SRM	UT/CSD	15	60+
T-97 Shuttle SRM	Thiokol	15	60+
Shuttle Centaur	NASA/Analex/LM	8	80+
Shuttle—Orbiter	NASA-JSC	30	80+

Commercial Aircraft
Military Aircraft
Unmanned Aircraft
Small Payloads
Satellites
Launch Vehicles

ATA ENGINEERING, INC.®

CUSTOMERS INCLUDE:

Applied SuperConetics, Cymer, Perkin-Elmer, Pratt & Whitney, Solar Turbines, FMI, Cummings Aerospace

PRODUCT EXPERIENCE INCLUDES:

Amusement-park rides, power-generation equipment, commercial and military vehicles, industrial machinery, large rotating equipment, metal-processing mills, rocket engines, consumer electronics, precision laser equipment, magnetic resonance imaging equipment

CODES UTILIZED:

Siemens I-deas® NX, IMAT™, Test for I-deas software, MATLAB®

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ATA ENGINEERING, INC.®

Operational Testing

OVERVIEW

Operational tests can be used to evaluate performance parameters and to troubleshoot problems, such as excessive vibration or premature fatigue failure of critical components. Identifying operating characteristics of equipment can confirm initial design objectives and ensure that problems will not be encountered in the future. Fatigue life estimates can also be investigated when the original design does not meet long-term operational integrity. Obtaining operating data is often the first step in a troubleshooting operation and can lend valuable insight when fixing problems. ATA has a wealth of experience not only in collecting operating data but also in interpreting the results and helping to solve real problems.

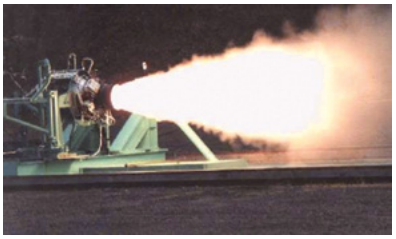
A key to understanding a structure's behavior as well as solving vibration problems is measurement of the operating environment. This kind of testing can determine both operating loads and responses such as strain, deflection, and acceleration. ATA has many years of experience in operational testing and is well qualified to both plan and execute these tests. Typical structures that we test include amusement park rides (supporting structures and running components), power generation equipment, vehicles (including large-scale people movers and monorail systems), large fans and mining equipment, metal-processing mills, motor-driven consumer electronics, and aircraft. ATA has all of the equipment required to install transducers, make measurements, and analyze the test data remotely or on site.

ATA routinely measures and interprets the following types of operational test data:

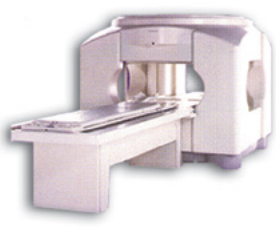
- Displacement
- Dynamic and/or static strain
- Acceleration
- Force and pressure
- Acoustic sound power levels
- Velocity
- GPS
- Temperature

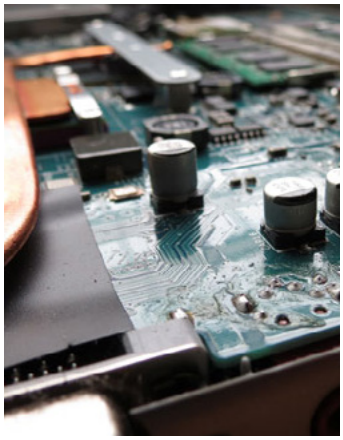
ATA's industry-leading high-channel-count acceleration and dynamic strain measurement capabilities allow us to provide a unique, high-value operational test solution by minimizing the number of individual test runs that must be performed to gather all required data. All equipment is fully portable and ruggedized for easy transport to a customer's site and performing data acquisition in tough environments. Smaller articles can be tested at ATA's in-house laboratory.

▼ ATA performs operational tests on a wide variety of large equipment including rocket engines and power generators



▼ ATA also performs operational testing of high-precision products such as laser lithography systems, MRIs, and disk drives





CUSTOMERS INCLUDE:

Wyle, NTS, BMT, Boeing, Sandia National Laboratory, Northrop Grumman, Pratt and Whitney

PRODUCT EXPERIENCE INCLUDES:

Qualification and environmental stress screening of electronic boxes, satellites

KEY SPECIFICATIONS:

B&K LDS V830-335-SPA16k
Sine force (peak): 2200 lbf
Slip table size: 24″x24″
Head expander size: 24″x24″

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ATA ENGINEERING, INC.®

Environmental Testing

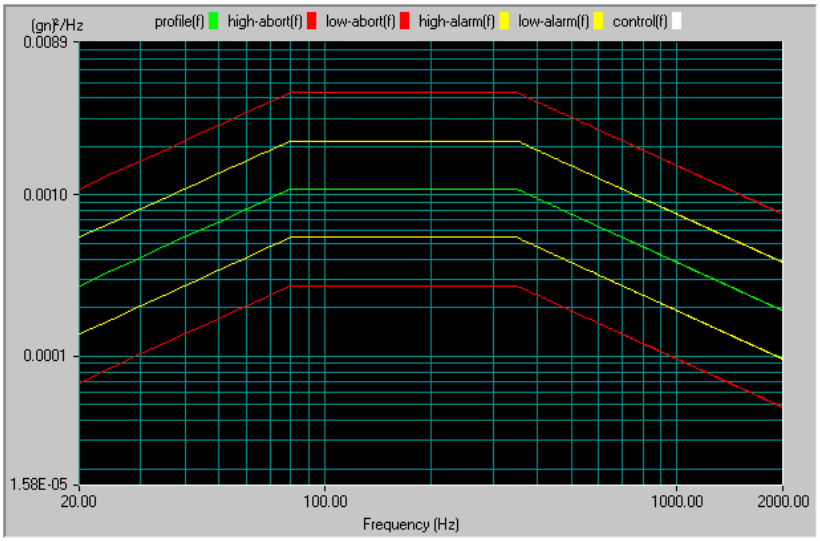
OVERVIEW

Environmental tests, which may be required in order to meet a standard or used to quickly assess the structural adequacy of a design, can be used to evaluate performance parameters and to troubleshoot problems such as excessive vibration or premature fatigue failure of critical components before the equipment is ever used in the field. ATA has years of experience in conducting environmental testing at other testing facilities and has recently added the capabilities to conduct testing in-house. ATA has a B&K LDS V830 shaker capable of random, sine, and shock testing for small and medium-sized components.

▼ ATA's in-house shaker capable of testing small and medium sized components

ATA provides additional value with a wide array of data acquisition systems and sensors. In addition to an eight-channel vibration controller, ATA maintains more than a thousand channels of acquisition equipment capable of measuring acceleration, displacement, dynamic strain, temperature, force, and acoustic sound pressure levels. Finally, ATA's postprocessing tools using our own IMAT MATLAB toolkit, providing real-time information to make an informed engineering decision.

▼ Example vibration profile using a state-of-the-art vibration controller



CUSTOMERS INCLUDE:

Brunswick Aerospace, Ford Aerospace, IBM, Martinez & Turek, Qualcomm, Wenzlau, Cummings Aerospace

PRODUCT EXPERIENCE INCLUDES:

Commercial and military vehicles, amusement park rides, robotics, satellite transporters, mobile shelters, ground-based antennas

CODES UTILIZED:

Siemens I-deas® NX Series, IMAT™, Test for I-deas software, MATLAB®

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ATA ENGINEERING, INC.®

Fatigue, Durability, Performance, and Road Testing

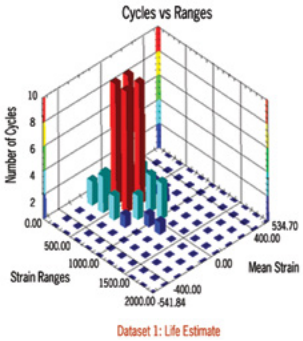
OVERVIEW

ATA's experience includes component and system testing utilizing strain gages, accelerometers, and many other available measurement devices. We can perform million-cycle tests or experimentally record the duty cycle and analytically predict the life of a structure. ATA's experience in this area extends to testing and evaluation of amusement park rides, automotive equipment, aerospace components, robotics, large-scale transportation vehicles, and other systems.

We typically use a variety of data acquisition systems and our own IMAT MATLAB toolkit for acquiring and analyzing strain gage data. ATA has one of the largest channel count strain conditioning systems in the industry and can acquire over one hundred channels of strain data concurrently. All data are collected with stand-alone digital data acquisition systems. This allows all channels to be measured simultaneously in rough environments without the need for a computer. The data can be reviewed immediately after each test run for quick-look verification. ATA's proprietary postprocessing tools greatly reduce the amount of time that a structure or vehicle has to be kept out of service for testing. Quick assessment of sensor functionality, repeatability, and overall measurement quality is completed within a few minutes after each test run.

Using ATA's proprietary MATLAB-based strain measurement toolkit, measured time histories can be converted to units of stress and subjected to rainflow cycle counting to provide 2-D histograms mapping stress ranges against mean stress values. Dynamic peak stress charts, a unique visualization of structural dynamic activity developed by ATA, can also be generated to precisely locate when and where high levels of stress occur during a typical operational test run. ATA is experienced in the evaluation of measured strain data according to most of the applicable fatigue codes, including DIN 1501.

▼ **Test measurement of actual duty cycles allows accurate predictions of the fatigue life of structures**



CUSTOMERS INCLUDE:

ATK, Boeing, Harmon Kardon, ITT, Kistler, Lockheed Martin, Pratt & Whitney, Seagate, Space Systems Loral

PRODUCT EXPERIENCE INCLUDES:

Satellite systems, launch vehicles and fairings, rocket motors, jet and propeller aircraft, automobiles, ships, consumer electronics

CODES UTILIZED:

VA One, AutoSEA2, I-deas Vibro-acoustics, NX Nastran, RAYON, SEAM

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ATA ENGINEERING, INC.®

Vibroacoustics

OVERVIEW

ATA engineers are among the industry leaders in the field of vibroacoustics, the study of problems involving sound transmitted through or radiating from vibrating structures and vibration or stress induced by high intensity acoustic loading. The company maintains a comprehensive suite of the latest vibroacoustic engineering tools, which include the following:

- Field and laboratory test-measuring of sound pressure, sound intensity, vibration, and stress
- Statistical energy analysis (SEA) for wide bandwidth problems and system-level design
- Finite element and boundary element (BE) analysis for detailed structural-acoustic design

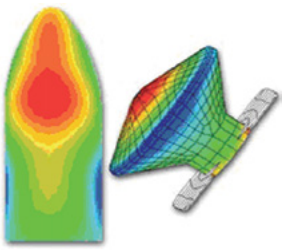
ATA's vibroacoustic engineering tools and experience allow the company to assist almost any program to predict product performance very early in the design stage. Our first task is often to define the loads for complex operating environments, including acoustic, aerodynamic, random vibration, and shock loads. We then use analysis tools, SEA, and finite element/BE analysis to provide valuable input to primary structure design. ATA also supports detailed design of add-on noise insulation or silencing treatments and vibration isolation or damping treatments—all optimized for minimum cost and lowest added mass.

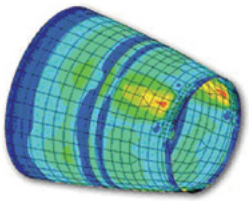
For noise reduction and sonic fatigue mitigation problems encountered in operating products and systems, ATA typically uses a cost-effective combination of test and SEA or BE analysis. This test/analysis approach ensures fast and reliable problem diagnosis and establishes a quantitative physics-based model for accurately evaluating the most effective design change options.

Common applications include the following:

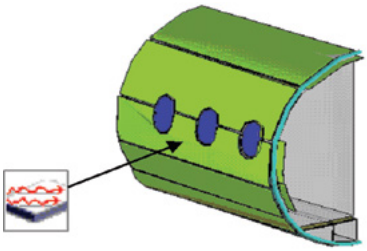
- Defining random vibration and acoustic environments for equipment on satellites
- Launch vehicle and payload fairing design for liftoff acoustics, buffet and aero-elasticity, transonic aerodynamics, separation shocks, and reentry loads
- Aircraft/rotorcraft fuselage and interior trim design for control of cockpit and cabin noise levels, both subsonic and supersonic

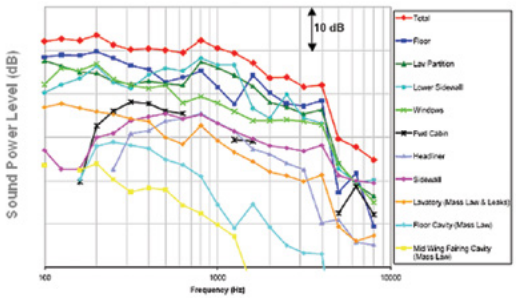
▼ ATA uses boundary element analysis for fairing interior acoustic and random vibration analyses of rocket motors

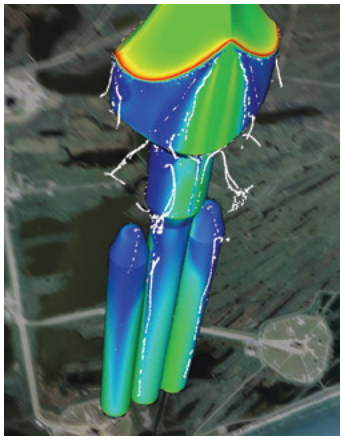




▼ ATA uses statistical energy analysis (SEA) for design of aircraft fuselage and interior trim to meet cabin noise control targets







CUSTOMERS INCLUDE:

Air Force Research Laboratory, Cessna, General Atomics Aeronautical Systems Inc., NASA, Northrop Grumman

PRODUCT EXPERIENCE INCLUDES:

Launch vehicles, payload fairings, airframes, fuel tanks, wind turbines, turbofan engines, heat exchangers, flow meters, and medical devices

CODES UTILIZED:

STAR-CCM+ (by CD-adapco) including parallel licenses, Abaqus CEL (by Simulia), NX Thermal/Flow, TMG/ESC for I-deas and Femap, U²NCLE, and CHEM

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ATA ENGINEERING, INC.®

Computational Fluid Dynamic (CFD) Analysis

OVERVIEW

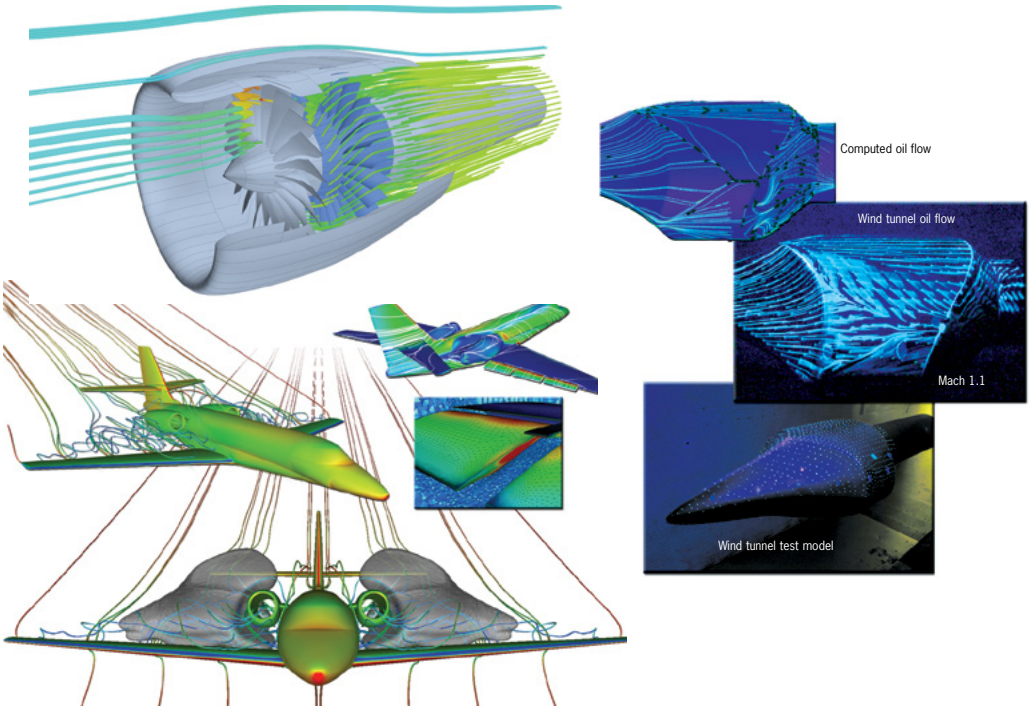
Computational Fluid Dynamics (CFD) is the process of numerically solving fluid dynamics equations to predict resultant flow fields. It is used to model a rich variety of flow phenomena, as well as to define thermal and structural loads on bodies immersed in fluids. ATA is experienced in performing CFD analyses for aerospace and industrial customers. Typical applications include flows over launch vehicles and stands, airframes and airframe components, rocket plumes, fuel tanks, heat exchangers, and turbomachinery. ATA's CFD analysis support includes the following:

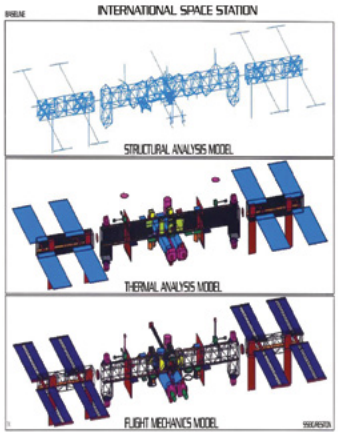
- Flow simulation and visualization
- Fluid-structure interaction
- Structural design optimization
- Advanced methods development

ATA is experienced with a variety of CFD analysis software including STAR-CCM+, Abaqus CEL, NX Thermal/Flow, TMG/ESC for I-deas and Femap, U²NCLE, and CHEM. We run our simulations on up to 32 parallel processors in-house; however, additional computing resources are available if required. Other pre- and post-processing software tools are used on occasion, and ATA's CFD analysts are experienced with software such as Gambit and Tecplot and can convert data to and from these and other software packages depending on customer preferences. CFD simulations typically result in large output data sets, and ATA works closely with customers to interpret and visualize the results and create meaningful and impactful graphics.

Sometimes flow simulation and visualization are the primary objectives of a CFD analysis; however, multi-disciplinary analyses that couple CFD results to a thermal, structural, or vibro-acoustics model are often required. The ATA Engineering team is experienced in working in a multidisciplinary environment. For example, we have commercialized an in-house code to map CFD pressure data to structural models, we work with our software partners to provide feedback for new code features, and we develop advanced analysis methods under SBIR funding.

▼ **ATA has provided CFD services for a variety of applications, frequently coupling the results to thermal, structural, and vibroacoustics analysis**





CUSTOMERS INCLUDE:

Boeing, Lawrence Livermore National Labs, Lockheed Martin, Micromotion, MTS, NASA, Sandia National Labs

PRODUCT EXPERIENCE INCLUDES:

Software specification development, CAE software translators, software integration, multidisciplinary process improvement, test data processing toolkits, temperature and pressure mapping programs, MATLAB-based software development, Open Architecture software, advanced CAE analysis software tools, graphical-user interfaces

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ATA ENGINEERING, INC.®

Software Development, Process Improvement, and Integration

OVERVIEW

For many years, ATA has developed custom and commercial engineering software with a strong focus on the integration or interfacing of dependent but stand-alone software solutions. This focus is based on our experience in the performance on multidisciplinary engineering programs and the identification of new methods and processes to improve the speed and quality of customers' existing processes.

ATA typically develops customer-specific solutions based on our customer's tools and processes and which provide improvements in time, quality, and cost. Based on an analysis of their particular requirements and processes, we develop use cases that can drive a software specification. The final software package is driven by this specification and user acceptance testing as the development progresses. An example of this is the I-deas Exodus Translator (IXT) for Sandia National Labs. Here, ATA developed an interface between Siemens I-deas® and the Sandia Exodus database that allowed virtually all of their in-house finite element codes to take advantage of the sophisticated I-deas finite element model generation and results display capabilities.

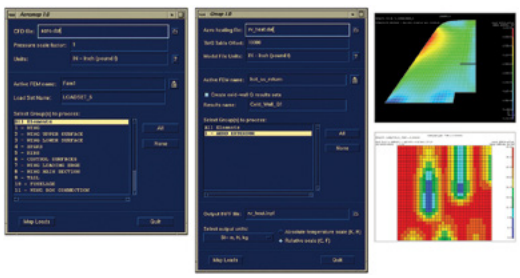
ATA staff also develop tools for multi-organizational programs. A key example of this is the I-deas² software product used for conceptual design of the International Space Station. This software product was developed for the NASA Centers and the Program Support Contractor for all preliminary analysis. It allowed more than 75 engineers from all engineering disciplines including structures, dynamics, orbital mechanics, thermal, and more to develop their models based on an automatic abstraction of the same geometry.

ATA also develops commercially available products that support analysis- and test-driven design, including the following products:

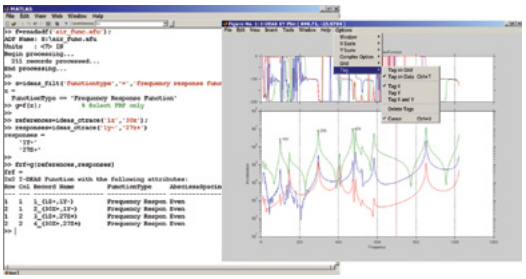
- ATS: Automated Test Setup package for TEDS sensors
- Attune: Test and analysis model updating and correlation toolkit
- IMAT: I-deas Test to MATLAB® interface and toolkit
- HeatMap and PressMap: Map temperatures and pressures from aeroheating and CFD codes to I-deas NX
- Automated Strain Interface (ASI): Configure VXI strain gage hardware for dynamic-strain measurements
- ATRAN: Convert response histories/spectra from one file format to another (including Nastran punch-cards and tables, universal files, OP2 files, and comma-separated values)
- TRATRAN: TRASYS to I-deas translator

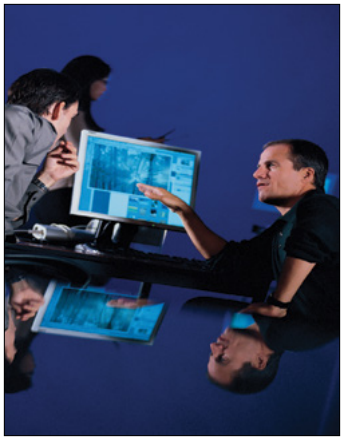
ATA is also a value-added reseller (VAR) for the Siemens suite of computer-aided engineering (CAE) digital simulation tools including NX CAE, NX I-deas, NX Nastran, and Femap. We work hand in hand with Siemens to provide software sales, pre/post-sales technical support, training, and implementation services. For more information on these products, contact Dan Kuriger at 858.480.2069 or by email at dan.kuriger@ata-e.com.

▼ Map pressure and aero-heating results to structural models



▼ Import and manipulate I-deas test data in MATLAB using IMAT





CUSTOMERS INCLUDE:

Ball Aerospace Corporation, Boeing Commercial Airplane Group, Bose, Caterpillar, Honeywell, Lockheed Martin, NASA, Nokia, Northrop Grumman, Orbital Sciences Corporation

CLASS LOCATIONS:

ATA San Diego or customer site (minimum of six students required for on-site training)

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ATA ENGINEERING, INC.®

Training

Solution Partner PLM SIEMENS

OVERVIEW

ATA provides training in a broad range of engineering disciplines. Training can either be based on standardized training materials or can be customized for your specific application. Courses can be held at your location or at ATA's headquarters in San Diego.

ATA is the developer of Siemens PLM Software's NX Nastran courses and is the preferred provider of NX Nastran training in North America. Nastran courses developed and taught by ATA include the following:

- Introduction to Finite Element Analysis
- Introduction to Dynamic Analysis
- Advanced Dynamic Analysis
- Introduction to DMAP
- Superelement Analysis
- DDAM Analysis
- Sensitivity and Optimization
- Coupled Structure/Acoustics Analysis

These courses are taught with various pre/post processors including Femap and NX. Our instructors, all expert users of Nastran, have in many instances personally developed the class material. In addition to Nastran training, ATA offers training in the following Siemens PLM Software tools:

- NX Response Simulation
- I-deas Response Analysis
- I-deas Durability Analysis
- Introduction to Femap Pre- and Post-processing
- Advanced Femap Pre- and Post-processing

ATA engineers have provided expert services to the aerospace industry for over thirty years and, based on this experience, have developed and provide the following aerospace-specific classes:

- Thermal Analysis of Spacecraft
- Structural Dynamic Analysis for Aerospace Structures
- Vibro-Acoustic Analysis of Aerospace Structures

ATA classes provide extensive hands-on workshops based on practical examples so that attendees can leverage the training immediately upon returning to work. Training materials are routinely updated to include the latest features and functionality. Classes are rated as "excellent" by students in content, instructors, equipment, and overall course experience; students consistently rate the classes as "much better than" other CAE classes they have attended.

Custom training can also be provided in the following areas:

- Solid Modeling, Design, and Drafting
- Finite Element Modeling and Analysis
- Coupled Loads Analysis
- Modal Test Theory and Application

Class instructors come from our industry-leading technical staff and are highly skilled consultants who possess excellent communication skills. The classes aim to provide engineers with skills that can immediately be applied in their jobs.

To receive regular updates on class schedules and new class offerings, sign up for our quarterly training newsletter by emailing John Bretl at john.bretl@ata-e.com.

ATA Engineering, Inc. — "A Valuable Asset"

UNIQUE HIGH-VALUE TECHNICAL SOLUTIONS

ATA Engineering solves design problems. Through our unique combination of test and analysis capabilities, knowledge of your products, and the expertise and dedication of our people, we have established a reputation for excellence over the last thirty years and distinguished ourselves from other service providers.

We are able to provide unique, creative, and comprehensive solutions to your design concerns:

- We can provide integrated design, analysis, and test teams with all the skills needed to support a complete design project, or we can supplement your existing staff on a person-by-person as-needed basis.
- We have best-in-industry test and analysis tools that maximize our productivity and support your tight schedules and budgets.
- Our staff has an average of more than twelve years of relevant industry experience per person.
- We have experience in a broad cross-section of industries which allows us to leverage the best-of-the-best tools, processes, and methods on your design.

WHAT OUR CUSTOMERS SAY

"ATA has excellent technical capabilities and has proven itself to be a valuable asset during the development and qualification of the RL10B-2 for the Delta IV program."

Frank Moerhle
Senior Structural Engineer
Pratt & Whitney

"ATA was directly responsible for ensuring the success of our program and saving tens of thousands of dollars of recovered schedule."

Craig Huber
X-34 GVT Test Director
Orbital Sciences Corporation

"ATA staff went above and beyond in order to complete the instrumentation in time for the test. ATA is an excellent company to do business with. You are a team player and committed to making the customer's test a success."

Phil Mott
Staff Engineer
Lockheed Martin Space Operations

"As always, ATA performed excellently in a very technically challenging project with a very compressed schedule. ATA has become a valuable member of the Martinez and Turek, Inc. design team."

Dwight Leung
VP, Engineering
Martinez and Turek, Inc.

"During the project some unforeseen work developed which would have hindered a launch – ATA staff sacrificed much personal time to support analyses and develop a methodology which allowed for a better understanding of issues. The work by ATA was recognized and appreciated by Lockheed Martin and the Air Force customer."

Sandra Mossman
Titan IV Technical Lead
Lockheed Martin Corporation

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