Interactive Analysis and Display System

www.symvionics.com/iads

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What is IADS?

- Interactive Analysis and Display System.
- The IADS Software Package runs on a Windows PC.
- Realtime Display and Analysis of Test Data.
- Flexible Simulation of Flight Instruments and Traditional Test Equipment.
- Local, Portable Flight Data Storage. Flight Data can be “Replayed”.

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Why was IADS Developed?

- Increase Confidence and Speed in Test Point Clearance Decisions in the Mission Control Room.
- Handle Large Data Throughput. Store Every Data Point.
- Decrease Dependence on Specialized Hardware.
- Minimize System Modification Turnaround Time Through Software.
- Exploit Mature Networking and Processing Power of the Windows PC.
- Avoid/Circumvent Delays in Post Flight Data Delivery.
- Decentralize FFT Computation. Accomplish Complex Analyses in Real Time if Possible.

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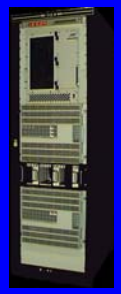
Real-Time IADS Configuration



Range
Telemetry
Processor
Or
Flight
Simulator

IADS
Caching
Data Server

Dedicated
Network
Switch

IADS
Operations
Console Workstation

IADS
Display
Workstations

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Post-Test IADS Configuration

Aircraft Data Storage Media

Post Test Data Processing Center

Mission Control Room

IADS Software running on Engineer's Workstations

Network Attached Data Storage Server

Engineering Workgroup

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IADS Data Handling

- **Every Data Point Stored and Available To All Clients**
  - Essential for most analysis and limit checking
- **Data is Time Aligned**
  - Manditory for derived equation accuracy
  - Multiple parameter comparison
- **Full Data Scroll Back**
  - Perform review & analysis in control room
- **Walk Away Media**
  - Post-Test analysis can begin immediately

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Some System Capabilities

- **Time Domain Analysis**
  - Extract meaningful data from noisy responses
  - Identify modal parameters (MDOF, SDOF)
  - Leverage powerful derived equation engine for custom analysis
- **Frequency Domain Analysis**
  - Real time PSD's (as well as Frequency Response Functions, Nyquist, Octave Band)
  - Identify Modal Parameters (SDOF, MDOF)
  - Stability analysis/Feedback system analysis
- **Parameter Identification**
  - Record Aircraft inputs and measured responses
  - Inputs and derivatives used to run simulation
  - Measured/computed response compared to create error measure
  - Program changes derivates to obtain better match

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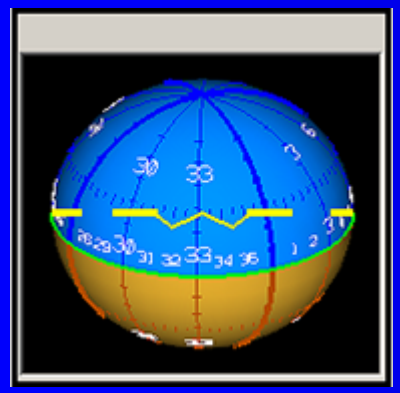
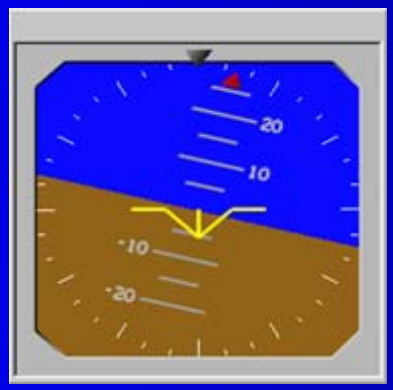
ActiveX Controls

- **Predefined IADS ActiveX Control Palette**
  - Cockpit audio/video players
  - 3D aircraft models
  - Dials and gauges

- **Display Extensibility**
  - Use third party displays
  - Create your own displays
  - Add displays on the fly





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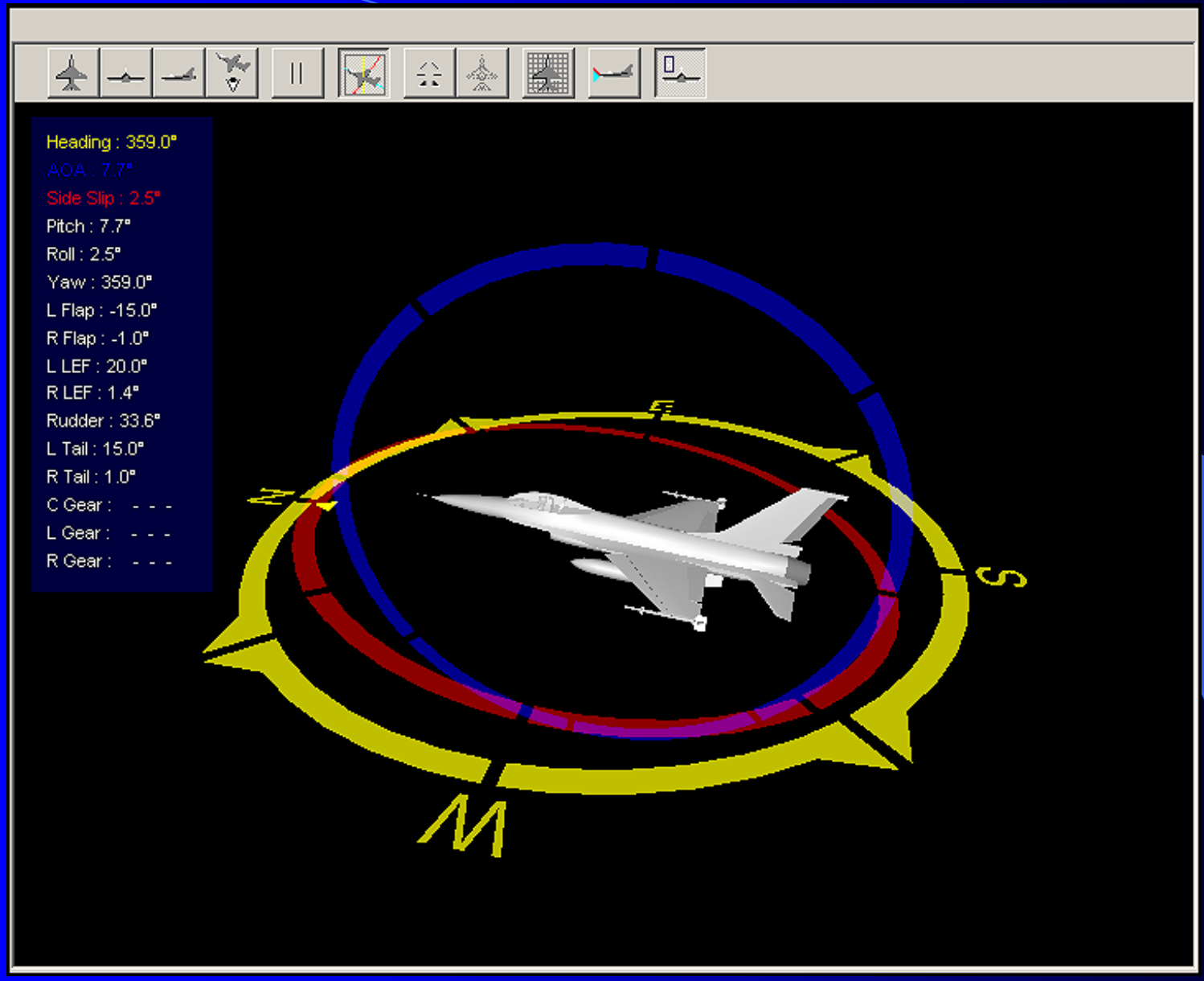

3-D Model Control

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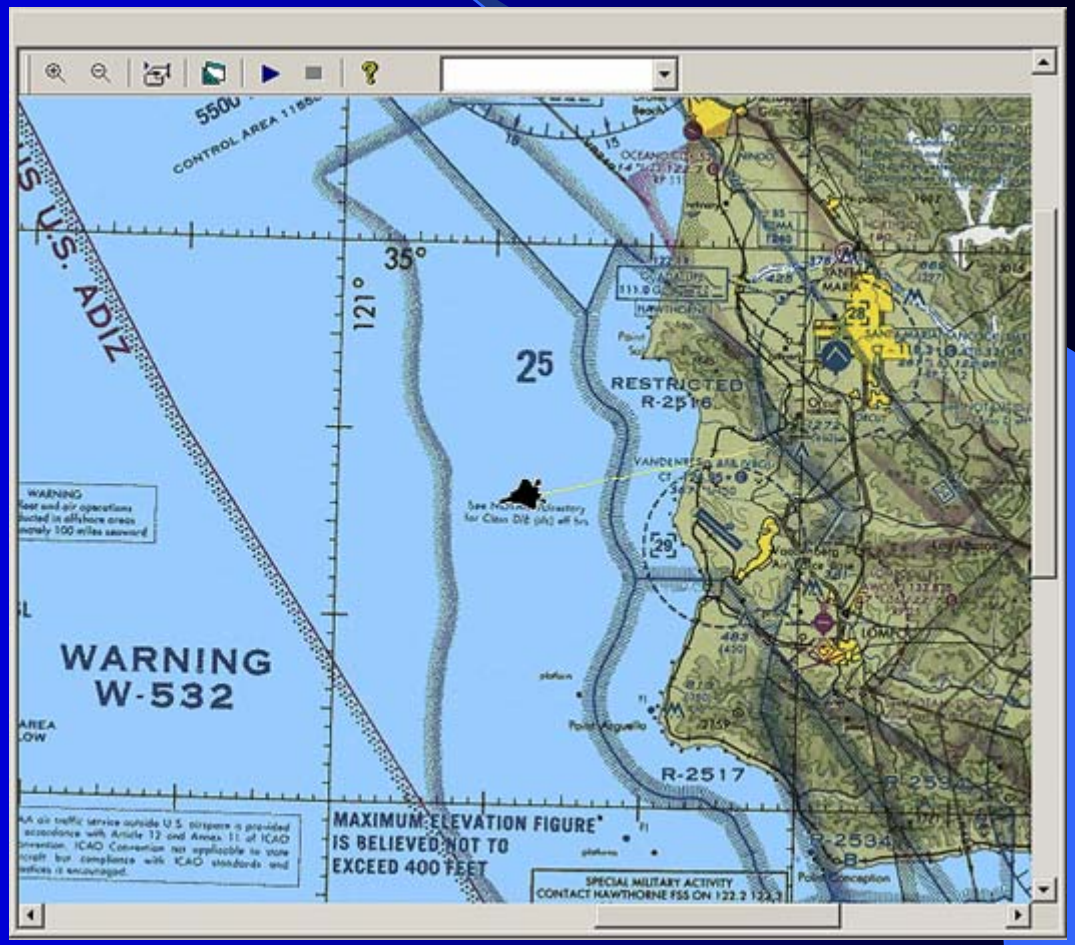
Moving Maps

- **Real Time Situational Awareness Tool**
  - Incorporates data from various sources
    - Target
    - Aircraft



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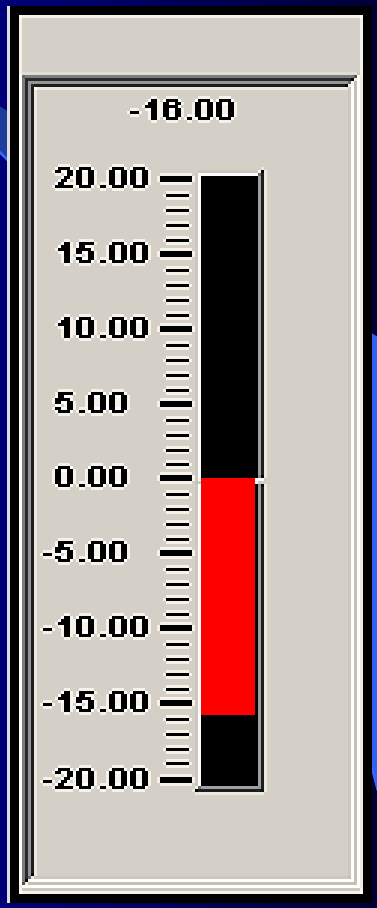
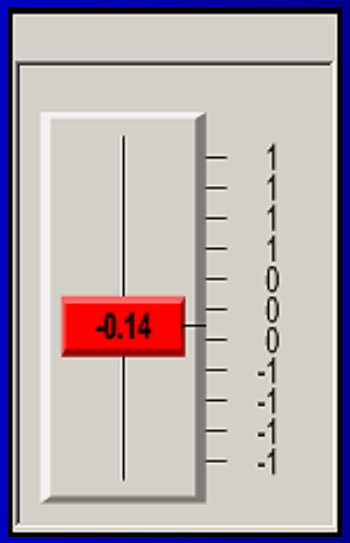
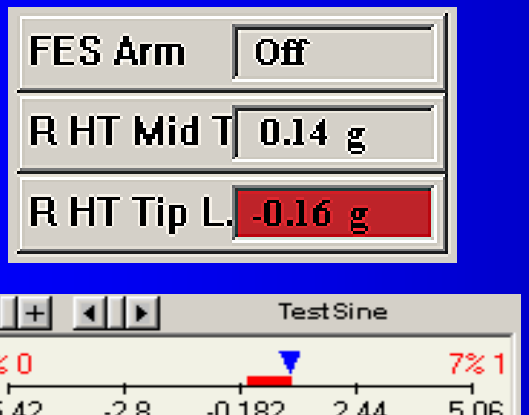
Numeric and Bar Displays

- **Alpha Numeric & Annunciators**
  - Convert data to text
  - Limit checking
  - Dynamic color ability
- **Sliders**
  - Load limit checking
  - Max load limit logging







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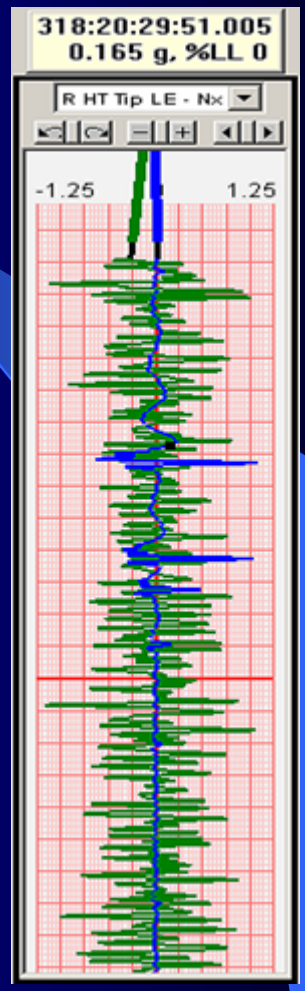
Strip Charts

- **Strip Chart**
  - Analogous to paper strip chart
  - Builds upon previous engineering experience

  - Adds much more capability
    - Analysis
    - Threshold checking
    - Multiple Parameters
    - Data Cursor / Global Cursor
    - Data Export

  - No “ink pens” to refill



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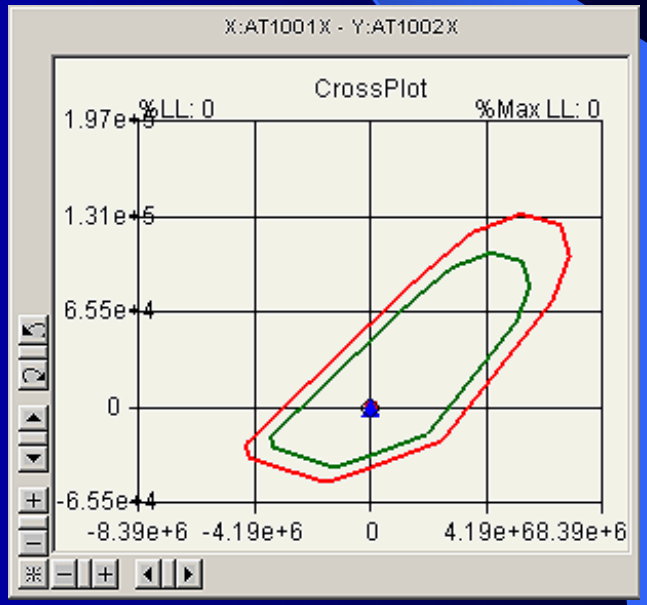
Cross Plots

- **Cross Plot**
  - Multiple parameter pairs
  - Ability to add/change envelopes on the fly
  - Calculate 2 dimensional running & max load limit
  - Data history tail
  - Data cursor / global cursor



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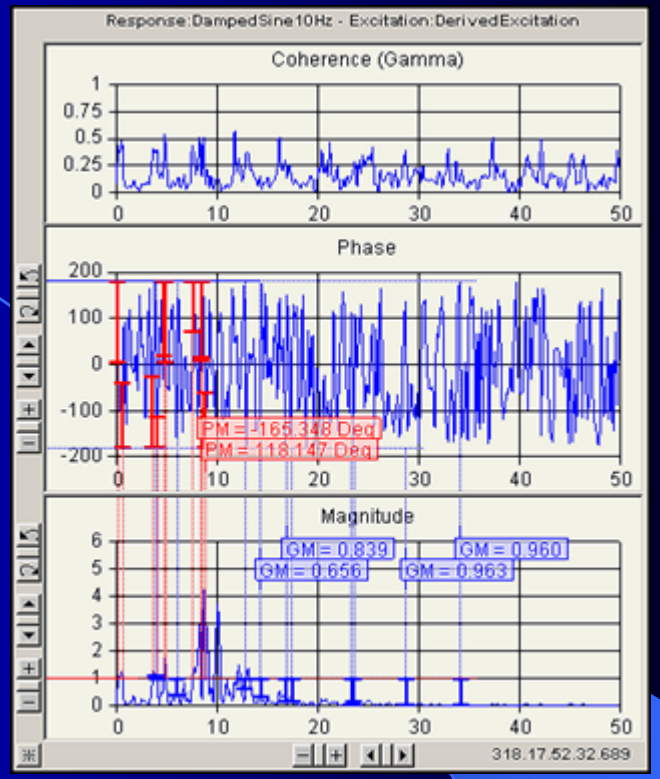
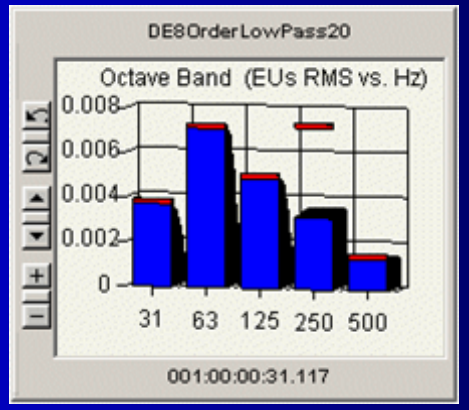
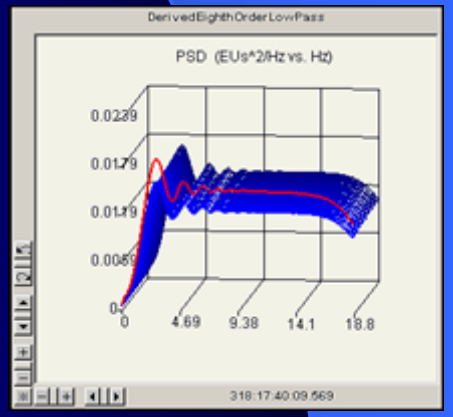
Frequency Plots

- **General Capabilities**
  - Peak hold
  - Block size, overlap, averaging
  - Windowing
  - Chirp Z transform
  - Global cursor
  - Waterfall option
- **Plot Types**
  - Power spectral density/auto spectrum
  - Octave band
  - Frequency response functions
    - Bode
    - Phase & Real
    - Phase & Imaginary
    - Coherence
    - Coquad







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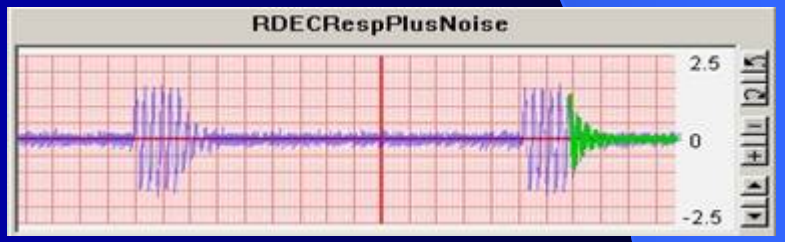
Time Domain Analysis

- **Averaging Techniques**
  - Used to reduce the influence of nonlinearities
  - Used to reduce the influence of noise effects

- **Randomdec**
  - Isolate randomdec signature from ambient response data

- **Auto Correlation**
  - Correlate a time slice with itself to separate random variations from useful signal

- **Pseudo Randomdec**
  - Average out noise in the data, leaving only the response of interest



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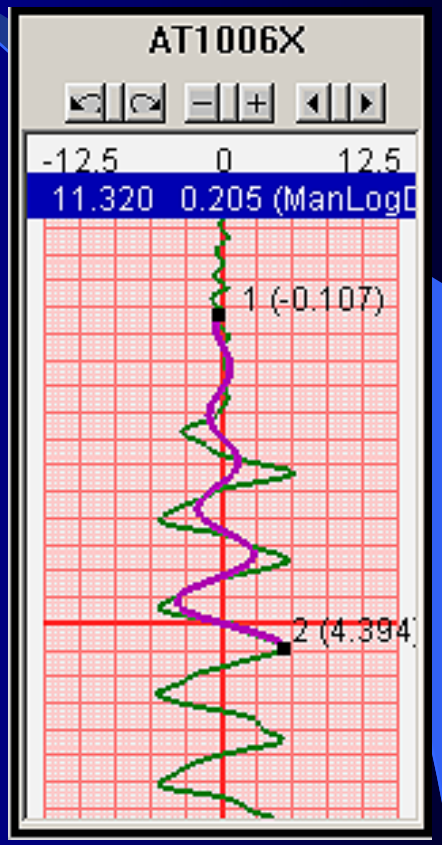
Time Domain Analysis

- **Modal Analysis Methods**
  - Extract the frequency and damping associated with structural modes
  - Log Decrement
  - Averaging
  - Log Dec Picking
  - Time History Curve Fit

- **General Analysis**
  - Trigonometric functions
  - Boolean operators
  - Arithmetic operators
  - Bitwise operators/functions
  - Elementary math functions
  - Signal generation
  - Time based functions
  - Statistical
  - Specialized
  - Interpolation
  - Get/set functions



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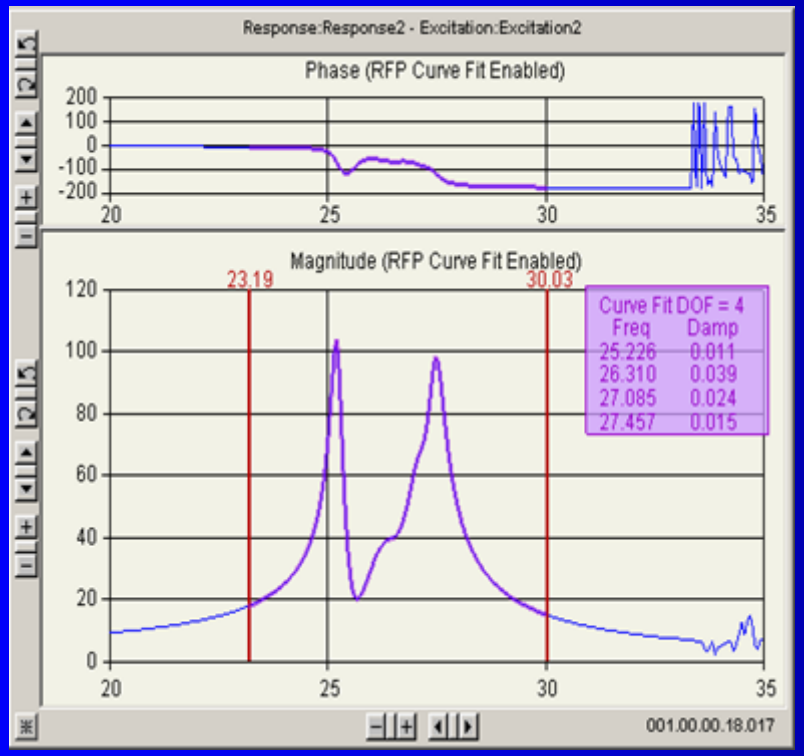
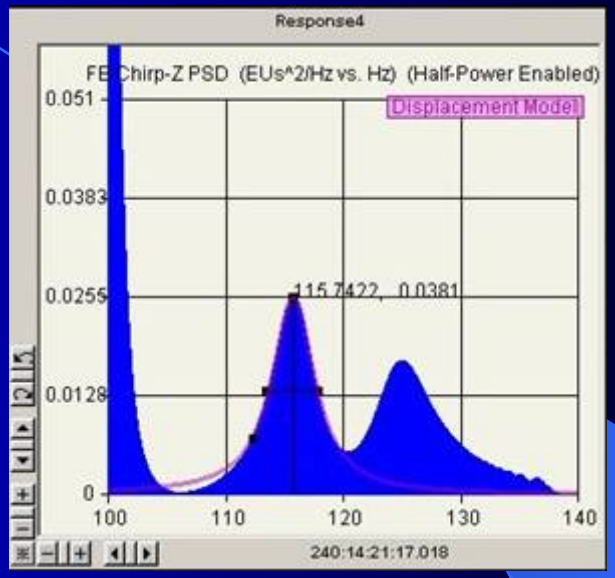
Frequency Domain Analysis

- **Modal Analysis**
  - Half power damping (SDOF)
  - RFP curve fit in real time (MDOF)





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System Extensibility

- **Matlab**
  - IADS can export data directly into Matlab or .Mat file
    - Single parameters
    - Parameter groups
  - IADS provides “MEX” interface to IADS data files
  - Matlab COM Objects
- **Excel**
  - IADS can export data directly into Excel
    - Various time and precision formats
    - Data alignment
- **Automation Interface**
  - Can program IADS from VB or C++
  - Create analysis plug-ins
  - Add derived parameter functions

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IADS Customers

EDWARDS AIR FORCE BASE:

F-22 COMBINED TEST FORCE
Four Control Rooms at Ridley Mission Control Center; Post-test system at the CTF Facility

FIGHTER COMBINED TEST FORCE
F-16 Joint Enterprise Test System (JETS)

GLOBAL REACH COMBINED TEST FORCE
C-17 and C-130 Aircraft Testing

NASA DRYDEN
Western Aeronautical Test Range (WATR)
Williams Research Aircraft Integration Facility (RAIF)

TEMS IFAST
F-16 and F-22 Simulation Displays

BENEFIELD ANECHOIC FACILITY (BAF)
Supports Installed Systems Testing for Avionics Test Programs

Air Borne Laser (ABL) Program
Support Range Safety Displays

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IADS Customers

LOCKHEED MARTIN AERO - Ft. Worth, Texas, Marietta Georgia and Palmdale
F-16 Joint Enterprise Test System (JETS)
Peace Marble Program
C-5 AMP Program
F-22 Test Program
F-117 Test Program

EGLIN AIR FORCE BASE
Central Control Facility
Seek Eagle Program Office

NAWC/AD - Patuxent River, Maryland
E-2C Post-test Analysis

THE BOEING COMPANY – Seattle, WA
Post-test Analysis

KOREAN AEROSPACE INDUSTRIES
T-50 Golden Eagle Advanced Jet Trainer

PRATT & WHITNEY
F-22 Engine Program

Joint Strike Fighter (JSF)
Edwards AFB, California
Lockheed, Ft Worth, Texas
NAWC/AD –Patuxent River, Maryland

ISRAELI AIR FORCE
Peace Marble Program

Republic of Singapore

National Test Pilot School
Mojave, California

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Commercially available product. Numerous contracting options are available to procure IADS, including GSA contracting vehicles.

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