Integrated System Dynamics (ISYSD)

General Specification
- MATLAB-based dynamics toolbox
- Import NASTRAN, IMOS (CMS) structural components
- Assemble (CMS) system dynamic model
- Compute broad-band system modes + residuals
- Include non-linear joint mechanics
- Evaluate sensitivity to parametric uncertainties
- Reconcile predicted vs measured dynamics
- Simulate nonlinear system response
- Export system models for general applications

Basic Dynamic Analysis Process Flow

- NASTRAN Data
- IMOS Data
- Export Data

Note: Toolbox features include extensive graphical data review, parametric sensitivity analysis, test-analysis reconciliation

Front Panel Push-Button GUI

System Modes Function Group

- Modal Sensitivity to Joint Stiffness Variation

System Modes Function Group

Export of Response Data & Post-Processing in ITAP

Nonlinear Joints Function Group

Reconciliation of Joint Test and Analysis Data

Component Modes Function Group

Nonlinear Response Function Group

Applied 5 Hz Force in Y Direction
Joint Friction Response (Force)

Note: Time history data panels consist of spectrogram (upper left), time history (lower left), power spectrum (upper right), probability density (lower right)
General Specification

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Basic Dynamic Analysis Process Flow

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Front Panel Push-Button GUI

ISYSD Process Controller

Component Modes
- Import
- Filter
- Review

System Modes
- Define
- Vary
- Reconcile
- Review

Environment
- Transient
  - Random
  - Review

Component FRFs
- Damping
- Define FRFs
- Review

System FRFs
- Define
- Vary
- Reconcile
- Review

System Assembly
- Define
- Review

Nonlinear Joints
- Define
- Vary
- Reconcile
- Review

Linear Joints
- Define
- Vary
- Review

Linear Response
- Allocate Forces
  - Duhamel
  - Review
  - Export

Nonlinear Response
- Allocate Forces
  - Model Transient
  - Review
  - Export

Note: The modular task structure utilizes function routines, which may be used to define custom processing tasks.
System Modes Function Group

Select Mode

Mode 1 0.913 Hz
Mode 2 0.941 Hz
Mode 3 2.66 Hz
Mode 4 0 Hz
Mode 5 0 Hz
Mode 6 0 Hz
Mode 7 0 Hz
Mode 8 0 Hz
Mode 9 0 Hz
Mode 10 0 Hz

Select all

Ok Cancel

Model: modonep.mat ...Mode 7 0.913 Hz ...10-Oct-2003 11:03 AM

MODONE2A
MODONE2CP
MODONE2B

KE
PE

43% 14% 43% 47% 47%

6%

A NASA Origins Mission

TPF

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Modal Sensitivity to Joint Stiffness Variation

Figure No. 1
Model File: modonon2 Modal Sensitivity for Joint 1

Frequency (Hz)

P/P₀ (%)
Nonlinear Response Function Group

Applied 5 Hz Force in Y Direction  Joint Friction Response (Force)

Note: Time history data panels consist of spectrogram (upper left), time history (lower left), power spectrum (upper right), probability density (lower right)
Nonlinear Response Function Group JPL

Export of Response Data & Post-Processing in ITAP


Joint Deflection
Joint Force
Hysteresis Loop
Reconciliation of Joint Test and Analysis Data

Figure 14: "Measured" Data

Figure 16: Function: friction...Monte-Carlo Search Results

Measured Data
Monte-Carlo fit

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