ASD/CLAS: Dynamic Analysis Software System

Module	Description	Example Analysis Configurations		
		Linear Dynamics	Nonlinear Dynamics	Nonlinear Dynamics + IFSep
ASD/GUI Core	Intuitive/intelligent graphical user interface system: provides the user with easy and expedited analysis setups; enables fast user learning curves.	✔	✔	✔
ASD/CM	Configuration management (CM) engine: provides automated CM over all models, OTMs, forcing functions, and analyses; disallows non CM'd models from entering into analyses; provides automated bookkeeping; enables the entire analysis team to share models/analyses.	✔	✔	✔
ASD/Check	Comprehensive mathematical check module: conducts checks on dynamic math models and associated output transformation matrices.	✔	✔	✔
ASD/CMS	Component-mode synthesis (CMS) module: provides efficient CMS and dynamic math model reduction capabilities (all methods).			
ASD/MBSC	Multibody substructure coupling module: provides highly efficient multibody substructure coupling capabilities via linear/nonlinear constraint equations. Constraint equation types include rigid, multi-point, soft (springs/dampers), specified enforced motions, two-sided deadbands, one-sided deadbands, nonlinear springs, and nonlinear response dependent constraints. Allows for expedited addition/deletion of substructures. Expedites and stream-lines component analytical integrations and post-analysis recoveries.	✔	✔	✔
ASD/CLA	Linear coupled loads analysis (CLA) module: provides highly efficient linear multibody substructure coupling (see ASD/MBSC module description) and linear dynamic analysis capabilities. Direct and modal solutions; system-level and component-level damping schedules; single and multi-step numerical integration schemes.	✔	✔	✔
ASD/NCLA	<u>Nonlinear</u> CLA module: provides highly efficient linear/nonlinear multibody substructure coupling (see ASD/MBSC module description) and nonlinear dynamic analysis capabilities.		✔	✔
ASD/VCLA	<u>Variational</u> CLA module: leverages the ASD/CLAS' multibody substructure coupling and expedited analysis turnarounds with the capability to conduct automated sensitivity analyses allowing variations in component parameters such as stiffness, frequency, mass, damping, ...			
ASD/EM	Linear enforced motion module: provides highly efficient linear multibody substructure coupling (see ASD/MBSC module description) and linear coupled dynamic enforced motion analysis capabilities. All capabilities of ASD/CLA are available.	✔		

✔: Standard modules
✔: Analysis modules

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ASD/EMN	<u>Nonlinear</u> enforced motion module: provides highly efficient linear/nonlinear multibody substructure coupling (see ASD/MBSC module description) and nonlinear coupled dynamic enforced motion analysis capabilities. All capabilities of ASD/NCLA are available.		✔	✔
ASD/IFSep	Flexible-body interface separation/contact module (nearly complete): provides highly efficient linear/nonlinear multibody substructure coupling (see ASD/MBSC module description), nonlinear "response-dependent constraints", and nonlinear dynamic analysis capabilities to accurately simulate transient events including launch vehicle pad separation, staging, and spacecraft docking scenarios. Builds on the legacy ASD/NCLA module.			✔
ASD/RV	Random vibrations module (in work): provides the capability for highly efficient multibody substructure coupling for frequency domain and random vibration analyses.			
ASD/Results	Post analysis response viewer: provides quick and comprehensive review over ALL analysis max/min tables, time-histories, response spectra, ...	✔	✔	✔
ASD/Report	Custom report generator: automatically generates report appendices; enables quick preparation of <u>custom</u> reports with multiple analysis appendices and comparison tables.	✔	✔	✔
ASD/Utilities	Component tool kit module: provides a variety of useful utilities including coordinate transformations, damping matrix generation, unit conversions, ...	✔	✔	✔

✔: Standard modules
✔: Analysis modules

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