# Bihrle
APPLIED RESEARCH INC

DSix™

PC-based Flight Simulation
Development & Deployment Environment

The single simulation application that will support vehicle simulation requirements from concept through flight test to training

Bihrle APPLIED RESEARCH INC

DSix is a commercial software product for aerospace professionals that facilitates the development and deployment of aircraft flight models in simulation applications.

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The right tool for your simulation application
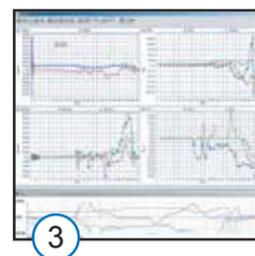
One Product, Many Applications

As the aerospace industry has evolved from long-term development cycles to rapid prototyping and spiral development, the need to rapidly build, analyze, validate and deploy simulations to support all phases of vehicle operations has become paramount. Rather than building from legacy simulation paradigms, BAR has developed a reconfigurable simulation environment designed to support diverse simulation applications as requirements expand. With the flexibility afforded through object-oriented design, standard plug-in interfaces, computational resources, and supporting tools and interfaces, DSix provides the development environment for the most demanding flight simulation applications – including desktop development and analysis, full Operational Flight Trainer (OFT) flight model host, hardware-in-the-loop simulation, and high-performance networked multi-vehicle applications.

Collaborative Environment

To maximize the benefit of simulation in an organization or program, the use of the tool cannot be restricted to a single individual or department. DSix facilitates collaborative simulation use with its novel design. DSix treats simulation objects as a project -- effectively a container for all project-dependant components such as code, data and any other services needed for the specific simulation. The project also contains interfaces to common project-independent functions that include Equations of Motion, environment, table look-up, program graphic interfaces, etc. This highly flexible architecture allows the user to tailor simulation projects to their needs and transfer the project to other users for collaborative simulation development, analysis and application. The developer simply passes the project file to other users, with user-controlled access to the project code and data. The use of the standardized model-dependant software allows the recipients to immediately utilize the simulation in their application, while the reconfigurable hardware interface allows individual users to quickly configure their simulation to their specific hardware application for immediate productivity.

Supports All Aircraft Types and Data Sources

Whether modeling a fixed-wing aircraft, rotary-wing aircraft, V/STOL aircraft, or UAV, DSix provides the single simulation infrastructure for all aircraft types and configurations. With DSix, there are no rigid model structure requirements, thereby providing you with total control over your flight model definition. Whether the model structure consists of a simple linear model or a complex flight model with separate components for each system and sub-system (e.g., aero, primary flight controls, automatic flight controls, propulsion, weight and balance, gear, fuel, stores, hydraulics, etc.), DSix provides the simulation tools and graphic interfaces that enable efficient model development and deployment. DSix also enables the integration of legacy flight models, even in situations that may require mixed programming languages and formats. To assist with the import and export of tabular databases (a key but often problematic element of simulation development) DSix provides AeroPort -- a configurable simulation database porting tool that can import and export more than a dozen native table database formats quickly and accurately.

Complete Out-of-the-box, Yet Highly Customizable

Out-of-the-box, DSix provides a complete non-linear 6DOF simulation environment and a suite of simulation development, deployment and analysis tools. DSix includes the simulation interface, atmospheric model, I/O device interface, real-time strip charts, plotting tools, DirectX-based graphics (for out-the-window visual scene, HUD & virtual cockpit instrumentation), sound interface and script engine. DSix Developer also provides a Project Wizard that speeds simulation development and deployment and a Module Wizard for creating custom DSix modules. Additional elements include a sample flight model with source code, the InfoFile table lookup configuration tool and data editing tool, the Aeroport database conversion tool, and developer's reference documentation. While the software is delivered with templates and components, many elements of DSix are customizable, providing you with the ability to edit the sample flight model, reconfigure interfaces and plotting capabilities, and create your own virtual instruments. The DSix scripting engine enables powerful batch and real-time scripting using JScript, VBscript and others for a variety of tasks ranging from the output of reduced simulation data in Excel to the automation of simulation verification and validation test procedures.

Powerful Integration With 3rd Party Software & Hardware

In order to leverage 3rd party tools to extend the capabilities of DSix, a variety of included and add-on modules have been developed for DSix. These add-on modules allow DSix to integrate with software products from Mathworks, Moog/Fokker Control Systems (FCS), National Instruments, and Lockheed Martin. For customers with specialized requirements, Bihrle engineers are available to readily develop custom add-on modules for a wide range of applications.

Mathworks. The included Bihrle Generic Target (BGT) interface in DSix provides Simulink users with a seamless way to integrate block diagram models developed in Simulink as real-time components in DSix. Using the Matlab and Simulink Coders from MathWorks, Bihrle Generic Target allows C code output to be directly imported and linked as a simulation element in DSix. The BGT module in DSix provides the user with a convenient graphical interface to expedite the mapping of code I/O as well as timing synchronization between the Simulink model and DSix. Combined with other native DSix/MATLAB interaction, these tools allows fully interactive model and control system development with no coding required.

Lockheed Martin. For customers requiring full-earth (WGS-84) or customizable terrain, the included Prepar3D module enables DSix to interface with Lockheed Martin's Prepar3D high-impact visual image generator for immersive, out-the-window visuals and geo-specific terrain.

National Instruments. The NIDAQ add-on module enables DSix to interface with the full catalog of National Instruments NIDAQmx I/O cards for access to a wide range of digital and analog applications, including DSix integration with flight simulator cockpit hardware.

Moog/FCS. The Moog/FCS add-on module enables direct DSix interfacing with a full range of FCS hardware, including electric control loading, g-seats and motion systems via ethernet.

Simulation
Engine
+
Data
Porting Tools
+
Analytical Tools
+
Hardware
Interface
+
Full-screen
Graphics
+
Network
Interface

MathWorks
Partner

PREPAR3D®

NATIONAL INSTRUMENTS

MOOG FCS
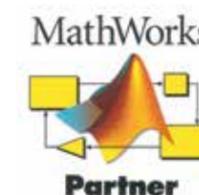
Common DSix Applications

1. Trainer Hardware Development

With the trainer's flight model hosted, use DSix as a test platform for displays, control loaders, or key hardware components in your trainer. A low-cost, real-time test bench that will reduce cost & schedule constraints on trainer hardware.

2. Trainer Math Model Development

Host simulator math models and execute real-time or non-real-time simulation sessions and evaluate model fidelity prior to simulator hardware integration. Load flight data for direct comparison with simulation results.

3. Flight Data Visualization & Analysis

Visualize flights by loading flight data and driving the DSix graphics model. Use plotting and manipulation tools to analyze flight events and prepare your simulation for validation efforts.

4. Flying Qualities Assessment

Develop and pre-prototype a simulation of a new aircraft configuration using wind tunnel data and/or computational data and then fly the model in real-time. Perform flight test maneuvers to assess the vehicle flying qualities & performance.

5. Hardware-in-the-Loop Simulation

Use DSix to host a flight model and interface with flight hardware like mission computers, flight control computers, or pilot input devices. With full-screen out-the-window graphics, a cost-efficient real-time lab is a reality.

6. Multi-Vehicle Simulation Scenarios

With several computers running the DSix simulation environment using its network interface module, users may host and run manned or unmanned multi-vehicle simulation scenarios to assess interoperability, collision avoidance algorithms, or multi-vehicle interaction aerodynamic effects.

High-fidelity fixed-wing & rotary-wing flight model development software

DSIX

Flight Simulation Environment

New

New Project Structure
- Component-based flight model project structure breaks code into aircraft components (e.g., propulsion, flight controls, aero, etc.) and provides more flexible flight model development, collaboration, testing.
- Project exports an interface that can be accessed from non-DSix simulation environment and external tools.

New Code Architecture
- Code base revamped for an even more modular architecture
- Provides enhanced flexibility and extensibility of DSix

New Runtime Edition
- Export models from DSix Developer Edition to the new, low-cost DSix Runtime Edition for simulation deployment.

New Graphical Module Manager
- Quickly view available modules and their purpose
- Enable and disable individual modules with a mouse click

New Plot Engine
- Powers the DSix plot utility and data editor
- Many features, more intuitive interface, less clutter

New Interactive Output Display
- Hyperlinks for recently used actions (e.g., opening a project)
- Displays output from script, simulation models or any module
- Multiple tabbed output windows
- Significantly improved messaging allows greater status communication without interrupting simulation operations.

New Extensible Interface Manager
- All DSix components expose interfaces directly through the interface manager
- Module and simulation model development greatly simplified by direct access to internal functionality
- Interface functions and function parameters integrate with Visual Studio's IntelliSense

Enhanced

Atmospheric Model
- Atmospheric effects model directly incorporated into DSix
- MIL-SPEC Dryden Turbulence model
- Modeling of wind shear, microbursts, gusts
- Multi-level steady winds

Enhanced support for newer Microsoft environments
- Visual Studio 2008 and 2010
- Windows XP, Vista, Windows 7

Enhanced scripting capabilities
- Direct access to DSix data
- DSix components provide direct script access
- DSix V1.95 scripts fully supported

Enhanced DSix Graphical User Interface (GUI)
- More meaningful menu structure
- More consistent windows and dialogs

Enhanced Variable Display Windows
- Improved performance & configurable update rates
- Drag and drop variable lists between windows
- Copy and paste text file lists

Enhanced InfoFile
- Selective table look-up
- Define groups of table look-ups or operate on individual tables

Enhanced Overdrive
- Overdrive manager allows overdriving select groups of simulation parameters
- Optional aero coefficient extraction

Enhanced Image Generator Support
- Interface to 3rd party full-earth database for geo-specific terrain in addition to the built-in ThirdWire image generator

Enhanced Sample Model
- BARJet light jet sample model with gear
- Features new component-based project structure
- Source code provided

Enhanced Default Instrument Panel
- "Glass cockpit" display
- Features airspeed and altitude ribbon gauges

Updated Wizards
- Project wizard
- Module wizard

More Portable Simulation Model Files
- All data saved in easy-to-read text format
- Project data and configuration data saved separately, so users can exchanges models without losing local configuration
- Hardware interface data can be stored for multiple platforms, so models transfer easily between desktop and cockpit

DSix V1.x Project Support
- DSix 1.x project format loads and saves to new text-based format
- Compiled DSix 1.x project code fully compatible