1. New Eagle Overview
2. MotoHawk Tool Box
3. MotoHawk Introduction
4. Building MotoHawk Models
5. MotoHawk Demonstration
Company History

- **2000**: New Eagle Software, LLC is founded
  - Specialists in Model-Based Embedded Control
    - Engineering services becomes primary business model
    - Embedded control products including RapidHawk
- **2003**: New Eagle sold to MotoTron
  - MotoHawk® software tool chain is created
  - Engineering services continue to grow
- **2008 July**: Woodward purchases MotoTron
- **2009 August**: New Eagle, LLC – Founded to address small to moderate volume client business.
  - Engineering controls applications and product development for customer needs centered around production ECU hardware.
  - Focused on utilizing current production, low cost component integration to provide cost effective system solutions, tailored to client requirements.
  - Sales representation of key controls components such as controllers, sensors and actuators.
  - Distributor of Woodward’s MotoTron Control Solutions
- **2010 February**: New Eagle launches its Controls Integration Business
Customer Project Phases

- **Concept**: 0 - 1 years
- **Design**: 1 - 2 years
- **Validate**: 2 - 4 years
- **PPAP**: 2 - 4 years
- **Production**: 2 - 4 years

**Tools**  Model-Based Controls Development - Controls Rapid Prototyping and Development

New Eagle employs the Mathworks/MotoHawk® in the Talon process to speed your product development from prototype to production.

**Products**  Rugged, Electronic Controllers and Displays

Production ready electronic controllers and vehicle components that can be purchased in low volumes, with no tooling required to get you to market faster.

**Services**  Applications Engineering and Product Support

Controls and Embedded system development, integration, and testing of complex, distributed systems. Product Support for Tools and Electronics
Shorten Time to Market

- MotoHawk® Model-based tool chain for efficient development
- Electronic controls, displays, component supply chain
- Applications engineering available short or long-term
Vehicle and Power Generation Control

- **Industrial**
  - Agriculture
  - Construction
  - Mobile Industrial
  - Power Generation
  - Gas Compression

- **On-Highway**
  - Hybrid Vehicles
  - Electric Vehicles
  - Passenger Cars
  - Trucks
  - Buses

- **Aero-Military**
  - Aerial
  - Ground
  - Sea
  - Unmanned Applications

- **Small Vehicle**
  - Scooters
  - Motorcycles
  - ATV / Snowmobile

- **Marine**
  - Pleasure Craft
  - Workboats
  - Auxiliary Power

Markets Served
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Model-based development tools for your control system development, from rapid prototyping to production

Mathworks® Model-Based Design
Production Controller Hardware
Extensive Block Set for Easy Modeling
Embedded Operating System Interface
Diagnostics Fault Manager
CAN Multiplexing including J1939
Value Proposition

Customer Application

Value Proposition

Keep Focus on Application Development

Outsource Tools, Software and Hardware

Optimize Recurring Costs

Tools

- MotoHawk: Design & Build
- MotoTune/CCP Tools: Calibrate
- MotoFlash: Manufacture
- MotoView: Service
- MotoUpdate: Field Update

Software

- Auto Code Enabled RTOS
- BIOS
- CAN Networking Libraries
- Application Library

- 80/20 Rule
- Maximize Re-use
- Prototype to Production
- Proven Success

ECU Hardware

- S12-24: 24 pins – HCS12
- 555-48/80: 48/80 pins – MPC555
- 5554-112: 112 pins – MPC554
- 565-128: 128 pins – MPC565

3rd Party ECU’s
Why MotoHawk & Model-Based Design?

- Systems evolve and iterate
- Evolution time of traditional software development is too long.
- Reducing evolution time provides biggest impact to improving market cycles.
- MotoHawk is built to accelerate application software evolution.
Rugged electronic controllers

Engine, Hydraulic, Powertrain, Hybrid Vehicle, Power Inverter, and General Purpose Vehicle Control

New Eagle MECHATRONIC CONTROL SOLUTIONS

Vehicle Electronics

 motoHawk

Display Solutions

Embedded Display Options

Fuse

Custom Window CE Displays
Talon™ Development Process

• Model-Based engineering approach which incorporates the best known practices:
  – Architecture Design & Requirements Generation
  – Control Software Development
  – Verification & Validation
  – Quality Management Process
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Features for the Developer

– Applications or Systems Engineers must be empowered to implement their own solutions.
  • Specifications are “executable”.
  • MotoHawk is capable of letting a non-software skilled engineer focus on the application while realizing an operable system.

– Prototyping and Production development must use the same tool chain, period.
  • Project management rigor is the only distinction.
  • MotoHawk is able to allow a developer to use existing production applications in a new or different way.
Open Architecture

Application Layer
- Sensor Software Component Interface
- Application Software Component Interface
- Actuator Software Component Interface
- Open System Architecture Interface

ControlCore Layer
- MH Interface
  - Operating System
  - Services
  - Communications
  - ECU Abstraction
  - Micro Abstraction
- MH Interface
  - Complex Device Drivers

ECU Hardware
- S12-24
- 5XX-48
- 5XX-80/128
- 5554-112
- 3rd Party ECU’s
• Features for the Developer
  – Re-usability of features is desirable, re-usable “code” is a must.
    • Microprocessors change more than we care to admit.
    • MotoHawk is able to render features to Freescale 5XX, 55xx and S12 families (and growing) as well as test stands and simulation engines.
  – Calibration and Service interfaces are complex and critically important.
    • There will be more calibration and probe points in a model than any other interface.
    • MotoTron is able to create and maintain those interfaces clearly to be used in MotoTune or a CCP based calibration tool (INCA, Vision etc).
• Features for the Developer
  – Fault Isolation, Fault Detection, Fault Containment, Fault Recording, and Fault Annunciation are the biggest tasks of any project.
    • MotoHawk assists this effort with an easy to use set of Fault Management blocks
  – Quality, Reliability, Repeatability, and Safety. Creating applications that allow managers to sleep at night requires constant vigilance.
    • MotoHawk support the ability to gather data points for process control purposes, record requirements traceability, test features, and produce a solid application.
Features for the Manager

- Ownership and control of the application layer
  - Intellectual property is maintained by application writer
  - MotoHawk also provides ability for portions of the application to be “hidden” or “locked” from other application writers through a Component Build. This can be a valuable tool to allow customers to include custom features without viewing the intellectual property of the supplier.

- The development and validation cycle
  - Production Models (code) are validated from day one of development
  - Interfaces are not changed by moving from one embedded target to another
• Features for the Manager
  – Development Timeline
    • The overall project time can be shortened by minimizing variation of tools and approaches
    • People do not need specialization
    • The same engineer learns to build the system while designing the software
    • Communication within the team is made easier
      – No translation from one tool to the other
      – No hand coding from hand written specifications or models
    • MotoHawk Component Builds
      – Allow ease of version control
      – Minimize software build times and maximizes reuse
      – Allow segmentation of work
    • Anecdotal data from customers: 6 to 1 development efficiency improvement
      – Work is done faster with smaller teams
• Features for the Manager
  – Emphasis is put on systems engineering of the product
  – Documentation is auto-generated
  – Peer Reviews and Design reviews are promoted by reviewing models rather than source code
  – Opportunities for Test (OFT) are increased by using pure simulation as well as traditional methodologies
  – Incremental Design/Build/Validate methodology is promoted
  – Component level validation and hard versioning are enabled within the larger application embodiment
Features for the Buyer

For the engineering buyer,

- MotoHawk development can be done with smaller teams in a shorter period of time
- 3rd party applications can be purchased and integrated by MotoHawk
- MotoHawk has a large user base and a company in business to validate and expand the tool

For the product buyer,

- The operating system has a wide range of customers to validate and spread the cost of development
- The operating system is configured at build time resulting in the smallest possible footprint (resource usage) while adopting to Model-based development techniques
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New Eagle uses the Model-Based Design implementation called MotoHawk.

Model-Based Design Reuses and refines models to develop embedded systems. The value is in the reduction of engineering effort including handoffs, hand coding, integration tasks, error detection and correction.

**Model elaboration**

- Research engineers
- Analysts
- Algorithm designers
- System engineers
- Architects
- Software engineers
- Test engineers
- System integrators
- Calibrators

Automated:
- code
- testing
- documentation
<table>
<thead>
<tr>
<th>Component</th>
<th>Simulation In the Loop</th>
<th>Hardware in the Loop</th>
<th>Code Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator</td>
<td>Driver Simulation and Maneuvers</td>
<td>Driver Simulation and Maneuvers</td>
<td>Interface to Driver (Throttle Pedal, Dash, PRNDL, etc.)</td>
</tr>
<tr>
<td>Controller</td>
<td>Controller Algorithms</td>
<td>Interface to Module Stimulus and Measurement Devices</td>
<td>Controller Algorithms</td>
</tr>
<tr>
<td>Plant</td>
<td>Plant Model</td>
<td>Plant Model</td>
<td>Interface to Plant (Fuel Injectors, Shift Solenoids, Speed Sensors, etc.)</td>
</tr>
<tr>
<td>Environment</td>
<td>Environmental Model</td>
<td>Environmental Model</td>
<td>Empty</td>
</tr>
</tbody>
</table>
Operating System Interface

Explicit Connection To OS Entry Points

Application Wide OS and Build Settings
HW Pin Interface and Behavior

Datalink Interface
Faults Detection and Action

Fault Components In Model

Anatomy of a MotoHawk Model

Diagnostics and Fault Management

Fault Components

In Model

Faults Detection and Action
3 Consumers of Models

- MotoHawk Generates ECM Builds (using Mathworks Embedded Coder)
  - SRZ -> Encrypted application for loading into a module
  - DLL -> MotoTune Database
- But, It also Builds a Datasheet
  - Documentation of the Application and MotoTune Interface is automatically Produced
- And MotoHawk builds a Simulation and Test stubs
  - Validation and Verification is outside MotoHawk using Simulation, static and dynamic HIL test hardware.
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Thanks for your Attention!

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