Synthesis Overview

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Quick Company Overview
Marinvent Background

- Privately-held Canadian Corp.
- Two distinct revenue streams serving two different sets of customers
- Stellar track record of success (Many awards)
- Organically funded business since 1983
- Research and Development, IP generation and IP exploitation
- Certification-related services of all kinds.
- +50 successful certification programs with TCCA and FAA

CGP and AS9100
Management Team

DR. JOHN MARIS
President & Owner

MR. PHIL COLE
Vice President Business Development

MR. SAM GRAINGER
Vice President Operations
## Awards

<table>
<thead>
<tr>
<th>Award</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canadian American Business Achievement Award</strong></td>
<td>Awarded for leading a joint enterprise demonstrating strong business growth, remarkable innovation, noteworthy contributions to local communities and the capacity to provide their partners with a global advantage.</td>
</tr>
<tr>
<td><strong>Canadian Aeronautics &amp; Space Institute: Trans Canada (McKee) Trophy</strong></td>
<td>Canada’s oldest and most prestigious aeronautical trophy awarded to Marinvent for the Canadian whose achievements were most outstanding in promoting aviation in Canada.</td>
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<tr>
<td><strong>Aviation Week &amp; Space Technology Laureate</strong></td>
<td>Awarded for &quot;...helping to transition from paper in the cockpit to a digital flight deck.&quot;</td>
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<tr>
<td><strong>Canadian Business Aviation Association Industry Award</strong></td>
<td>Outstanding contribution to aviation</td>
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<tr>
<td><strong>Aerospace Association of Quebec (AQA) Prix de l’Entreprise</strong></td>
<td>Aerospace company of the year</td>
</tr>
<tr>
<td><strong>Canadian Business Aviation Association Industry Award</strong></td>
<td>Awarded for the safety gains achieved through human factors enhancements, systems engineering and flight test services.</td>
</tr>
<tr>
<td><strong>Create the Future Award</strong></td>
<td>APM product winner</td>
</tr>
<tr>
<td><strong>New Zealand Ministry of Defense Award of Excellence to Industry</strong></td>
<td>Marinvent singled out as one of the two most valuable contractors from a pool of more than 800 contractors for contributions to C-130 LEP and P-3K capital programs.</td>
</tr>
<tr>
<td><strong>AIAC James C Floyd Award</strong></td>
<td>Aerospace company of the year</td>
</tr>
<tr>
<td><strong>C2-MTL Annual Aerospace Award</strong></td>
<td>Marinvent’s work on unmanned aerial systems flight test and evaluation with its Piaggio Avanti project singled out as aerospace innovation of the year.</td>
</tr>
<tr>
<td><strong>NASA</strong></td>
<td>Small Business Subcontractor of the Year (TASAR)</td>
</tr>
<tr>
<td><strong>NASA</strong></td>
<td>LaRC 2014 Group Achievement Award</td>
</tr>
<tr>
<td><strong>Canadian Defense Executive of the Year</strong></td>
<td>Dr. John Maris</td>
</tr>
<tr>
<td><strong>Canadian Aviation Hall of Fame</strong></td>
<td>Dr. Maris Inducted</td>
</tr>
<tr>
<td><strong>Canadian Defense Review</strong></td>
<td>Canadian Top 50 Defense Companies 2015 - 2020</td>
</tr>
</tbody>
</table>
Need for Synthesis® Tools Suite

Ever increasing complexity of projects with external regulations / requirements / acceptance criteria - COMPLIANCE

- Constantly changing
- Currently Ad-Hoc tools
- Not integrated
- Lots of paper
- Difficult to status, manage, predict, optimize
- Almost impossible to re-use data
Project lifecycle

- Value increases over time
- Link Teams / Information
- Unifies distributed teams (Supply chain)
- Built for working level
- Provides transparency to Management
- Optimizes execution
- Out-of-box functionality
- "What if" capability
- Standardization
Definitions

- Product – the end result of a project (a flight release, new release of PoH / aircraft operations with new gear, “certification” of hardware, software, etc.)

- Test environment / equipment, such as an aircraft, simulator, test rig / harness, test bench, etc.

- Users – who is involved on a project (stakeholders, QTP, FTE, FTA, etc.)

- Suppliers – groups of users from different units, companies, stakeholders, who need might need IP separation, of organization

- Test parameters – used to build simple and complex test plans and test cases
Building a Project – Starting Out (big picture)

- A project manager (or user with appropriate permissions) creates a new project when a contract is received and assigns users.
- The project manager creates at least one product and test environment for the project.
- The project starts with the creation of a requirements document, consisting of contract requirements, which is then reviewed and approved in Synthesis.
- A second requirements document is then created which comprises the estimate (schedule cost, etc.), which is also reviewed and approved in Synthesis.
- The object of the project is to demonstrate compliance with these two, and any other requirements documents.
Products

- Versioned - minor & major changes tracked (automatic CM)
- Describes a goal / target in a project
- All project data attached to a product it belongs to
- Changes to a product can drive changes in documents
  - for example, a major change in a product can force related documents to be revised and re-approved.
Test Environment

- Versioned - minor & major changes tracked (automatic CM)

- Describes a test environment, such as an aircraft, sim, bench, desktop PC (anywhere a test needs to take place)

- All project test plan data (tests) are attached to a target test environment testing will occur in (e.g.: target aircraft, system, etc.)

- Changes to a test environment can drive changes in documents
  - for example, a major change in an environment can force related documents to be revised and re-approved to ensure they are still applicable and correct for any changes made to the test environment.
Users / Suppliers

- Build-in basic roles – author, reviewer, approver, observer, project manager, etc.

- Includes approval for differing safety / risk levels in tests (no risk, low, medium, high, very high)

- Supports integration with LDAP, MS ActiveDirectory back-ends or database users
Test Parameter

- Describes an input or output for a test
- Configured for a project
- Ensures consistency across all tests and between test plan authors
- Can be any type of data with formatting and optional minimum and maximum limits
- Can define conditions for a test, and/or data to be collected / recorded when executing a test
- Configurable field from free-form entry, to restricted “pick” list
Building a Project – Next Steps

• All Synthesis projects are requirements driven

• Requirements can be anything that needs to be achieved, from contract requirements, functional, constraints, etc.

• Either the project manager can create documents and assign them to users, or individual users with author permissions can create documents

• Documents can also be general reports, memos, analysis documents and so on.
Documents

- Hierarchical, data-driven, documents (outlined numbering)
- Allows engineers to enter the data, and not worry about the layout
- Auto-generated indexes, headers, footers (including security markings, e.g.: built-in Top Secret, Secret, Protected, ITAR/Controlled Goods Restricted, Unclassified, and customizable)

- Automatic draft watermarks
- Revision history and automatic configuration manage and history
- PDF output
- Built-in dictionary (no data sent offsite)
Documents

- Live change tracking, including outdated requirements and requirements with outdated parents

- Modification / differencing of all document data, such as section text, requirements, test points

- Search for any text in any data (requirement, CAR/FAR, sections, test points, etc.)
**Requirements**

- Hierarchical requirements with configurable levels (default levels in order are Contract, Regulatory, System, Subsystem, Design)
- Parent-child relationships between levels
- Support for CSV import
- CAR/FAR regulatory fields (fully searchable)
- Configuration managed and versioned
- Labeling (safety, functional, constraint, etc.)
Document Life-Cycle

- All documents share the same life-cycle
- A document by the author, or an author is assigned (and can be re-assigned any time) by someone else
- Content is written (memo, analysis, requirements, tests, etc.)
- Users are assigned for review or approval
- Reviews can occur as many times as necessary (or not at all),
- Approval is required to release a document and allow its data to be linked to other data in Synthesis
Documents Life-Cycle

- Changes made to documents must be justified by the document author, so reviewers know the scope and context of the changes.

- Any changed data can be compared to its previous version.
Documents Review / Approval

- Notification is automatically sent for users assigned to review or approve

- Comments are managed, captured, and dispositioned inline

- Modifications and comments are shown to allow other users to understand what has changed and other user comments
Building a Project – Verification

- Test plans (which are also documents) need to be created to define test procedures.
- Each requirement specified must be tested.
- Synthesis considers a requirement to be completed when all requirements and tests linked to it have been passed.
- When all requirements in a project are complete, the project is complete.
- The simplest project may have requirements, which are linked to a single test which is then passed.
- More complex projects can have multiple levels of requirements, linked together, and linked to tests.
Test Plans

• Template-based test plans

• Test procedure templates with definition, hazard identification & mitigation, pass fail criteria, link to requirement

• Test points can be manipulated quickly by an author to construct simple (pass/fail) to very complex tests with multiple configurations, conditions, and recorded data.

• Risk level and mitigations is carried with the test point to ensure safety throughout
Test Cards

- All tests defined in a test plan are tested on a test card

- Test cards allow on-the-fly batches of tests to be run (e.g.: A flight test, bench test, “desktop” testing)

- Test cards auto-filter by test environment and product, and only offer users test points that can be tested together in the same environment

- Test points can also be filtered by any test parameter value
Test Cards

- Test cards can be completed in PDF forms on a laptop or tablet

- Completed test card PDFs can be uploaded, and Synthesis will automatically extract test data and statuses and add the PDF to the test card

- Test status can also be completed in Synthesis directly

- Test results are shown directly in test plans as they are completed, including snags and test plan report details
Tracking Progress

- The main source of tracking data in Synthesis is the project status page.
- This allows users to see requirements, what each requirement is linked to.
- The report can be used to navigate to requirements and test documentation.
Tracking Progress (cont’d)

• “0 of 13 requirements coverage/satisfied …” - How many of the total number of requirements has been satisfied by having all related tests completed for it.

• “3 incomplete requirements” – number of requirements that have some data associated, but the data has not been completed (e.g.: testing not complete)

• “10 requirements with no compliance artifacts” – the number of requirements which do not have any link to either a requirement or a test/test procedure.

• Left hand column is the requirement number, and version (number.version), then header (clicking on the requirement shows the trace dialog)

• Middle column shows the document the requirement is contained in, clicking the link will navigate to that document

• Last column shows any child requirements, and/or tests linked to the requirement. Clicking on the links will navigate to the requirement or test document
Reporting

- Any requirement can be clicked on in the project status, document (requirement or test plan), and test card to see its status

- Compliance data is also available (tests and other requirements)

- Versioning and history of the requirement is also listed

- This also allows what-if analysis: *If I modify this requirement, what is the impact?*
New Projects

- New projects can clone data (or even an entire project) from an existing project.

- This means similar project data, requirements, and tests can be leveraged easily with minor modifications for new projects.

- Continuing a project is also possible – baseline (snapshot) a project, then change requirements, and update any effected data. Previous history is **always** saved in Synthesis.
Requirements Import From DOORS (et al)

- Requirements can be directly imported and synched with DOORS (or other software)

- Requirements are referenced from DOORS so integrity is maintained

- All requirements, versions and updates are stored and linked
Requirements Analysis (Optional)

- All requirements are analyzed for strength of accuracy/ambiguity
- Accuracy check highlights the problem with the language used
- Solutions are offered and require user acceptance and input
### Example: Test Pdf.

**For Inputs**

- **001** Test has been passed and is locked.
- **002** Test is open “Not Exec”
- All fields can be input directly into the pdf. and record.
- Test is uploaded once connection is re-established
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