

October
2017

What's Up MAK

The Art of Simulation

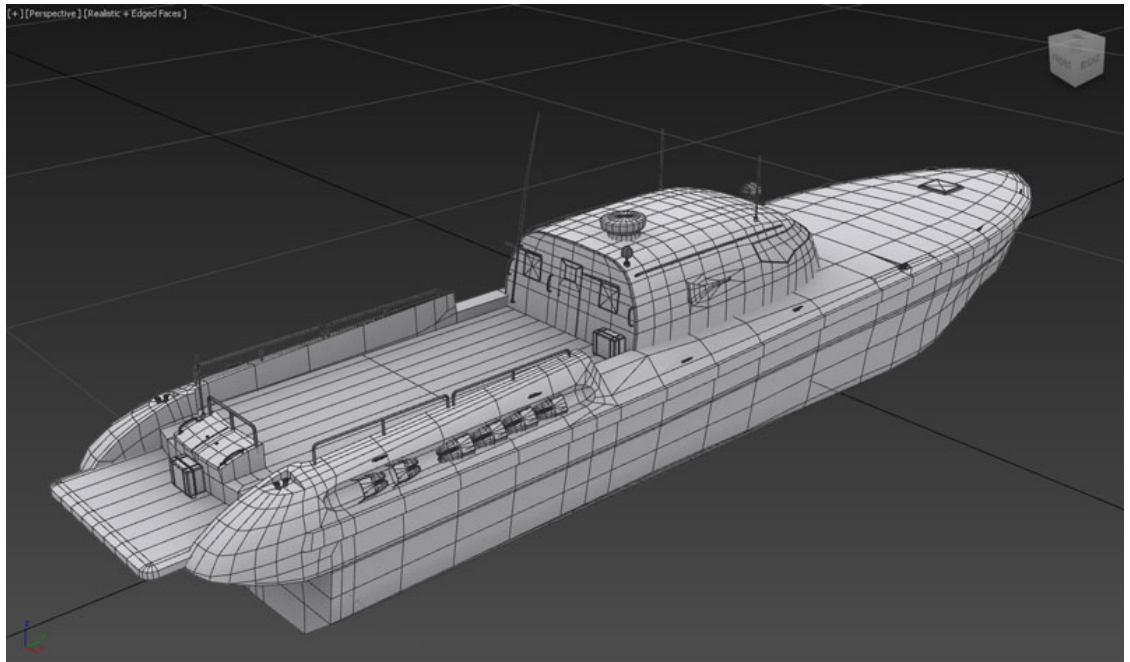
See how the art team works their magic!

MAK Assist

We want to help make whatever you're working on a success.

NewsMAKers

See Steve's report from the Australian Simulation Congress in Sydney, we've made two new releases, we look at some upcoming events, and announce new training dates!



The Art of Simulation

A core feature of any great simulation is great art. When considering factors like immersiveness and training fidelity, great art can mean the difference between disengaged students receiving mediocre training and effective simulation that makes a real difference.

The art team at MAK has three main areas of focus: Terrain, 3D models, and Human Characters (DI-Guy Models).

Terrain

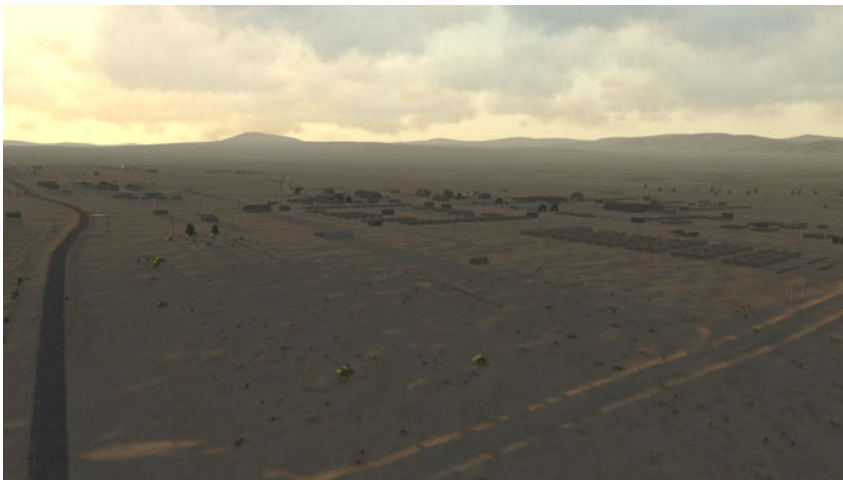
Terrain is tremendously important to the immersiveness of a simulation, as it is literally the setting and scene within which the simulation takes place.

When developing terrain, the art team at MAK starts with real data sources for elevation, imagery, and features. These dictate the contour of the landscape and designate specific landmarks. In many cases these sources need to be



enhanced for higher fidelity or just better aesthetics. When creating polygonal terrain databases, the art team uses industry standard terrain tools (like TerraVista, Trian3D Builder, or Terra Tools). Terrain tools aren't needed if the terrain uses the streaming and procedural techniques within VR-Engage, VR-Forces, and VR-Vantage.

Depending on the type of simulation, different approaches may be taken in the terrain building process. For a high flyer, simple imagery and elevation with a cut-in site model may provide enough definition for height and velocity cues. Closer to the ground, the procedural terrain techniques provide extreme feature density and very detailed ground resolution with just standard land use data. For a ground simulation, hand modeled buildings, roads, urban infrastructure, and vegetation need to be created. Finally, for the ultimate first person detailed terrain, a completely hand modeled approach is taken.



In certain cases (as pictured here), the elevation, as well as the imagery, has been hand-modeled.



3D Models

3D models represent all the entities within the simulation: vehicles, munitions, helicopters, airplanes, ships, and ground vehicles.

To build effective 3D models, the art team begins with in-depth research into each vehicle, collecting image references,



Great 3-D models are about more than just looking good. Articulated parts and animations are key. Here we see a mid-flight refueling, an articulated helicopter rotor, and a functional cargo door.

vehicle data, and schematic views in order to get good spatial comprehension of the models. Industry standard modeling tools like 3DS Max and Maya are then used to build a polygonal mesh. The models are then “unwrapped” – a technique of flattening a 3D model in order to apply a textures coordinates in a continuous equal area manner. Textures are then created with tools like Photoshop and Substance Painter. Material classification maps are created for proper Infrared Sensors representation. The model is configured with appropriate articulated parts, animations, levels of detail, and destroyed states in Creator, then saved as OpenFlight so it can be used by the simulation to render the model accurately within the scene.

Human Characters

DI-Guy human characters bring the simulation to life, populating the scene and interacting with the 3D models in both first- and third-person perspectives.

To create the most accurate-looking humans, the art team begins with photogrammetry of the subject. Photogrammetry involves taking multiple photos of a subject’s body and head at many angles, and then a model is created

virtually from the photos. Software rectifies and merges the photos and is able to create a high-resolution 3D mesh.

The original mesh contains too many polygons to use in realtime rendering. In order to maximize performance, a more efficient topology is constructed. Hand modeling may also be necessary, using Z-Brush to add that extra artist’s touch to the shape of the model.

Textures along with effects maps are then created, in order to produce high-fidelity sensor and light effects.



Then, the rigging process begins – a human/animal/ fish skeleton is placed into the topology, with each bone influencing the vertices of the mesh. Vertex influence is customized, to assure correct movement.

After photogrammetry and hand-modeling, we're left with an accurate, efficient mesh.

Once the rigging is complete, MoCap can begin. MoCap is a phase in which the art team uses motion-capture technology to collect animations and apply them to the rig. Once applied, the skeleton can move in a variety of smooth, coordinated ways, including walking, running, and dancing.



After MoCap, there is a configuration process, in which character variations are created. The software does interpolation for many different variants, making it easy to change into different uniforms and outfits. Hand items, heads, uniforms, and clothes are chosen. Like 3D models, material classification maps are also created for physically accurate visual and sensor rendering.



The art team themselves, via their DI-Guy characters created through photogrammetry- clockwise from upper right: Petr Kyn, Matt Descoteaux, Robert Bryan, and Ryan Fournier.

At the conclusion of this process, we have terrain to serve as the set, and we have 3D models to represent the simulation entities, and DI-Guy human characters populating the scene. Now we can create some dramatic action!

MAK Assist

We're always looking for ways to be helpful to everyone we come across – whether they're looking for initial guidance, deeper training, consulting, or full-on sub-contracting. No matter what you need from MAK, we want to help make whatever you're working on a success. When we overhauled our website a few months ago, we decided to devote a whole product segment to helping people – and we've named it MAK Assist.

As we see it, there are four distinct areas in which we can be of assistance – User Support, Training, Consulting, and Services.

User Support

When our customers buy MAK products, we don't just give them a download link and move on. We challenge ourselves to provide the best technical support available.

Customers under maintenance get direct access to our entire engineering team. That's right – we don't have a separate support team, so you talk directly to the people who developed the software.

Users also enjoy access to first-experience guides and user guides to help them along. First-experience guides help new users get up and running quickly, assuring a successful experience the first time you run the software. The user guides consist of at least one technical manual per product designed to help if you're looking for a detailed explanation of the software.

Each of our products is designed to be flexible and customizable, so in addition to the applications that are controlled by a graphical user interface and stimulated by distributed network traffic, there are interfaces for application programmers (APIs).

Finally, the User Support section features examples – MAK products come with sample code, scenarios, and terrain databases. These provide a starting point for users to learn best



There is a comprehensive library of User Guides for each MAK product

practices. Our bonus materials section of the website includes access to additional terrain databases and tools for your projects.

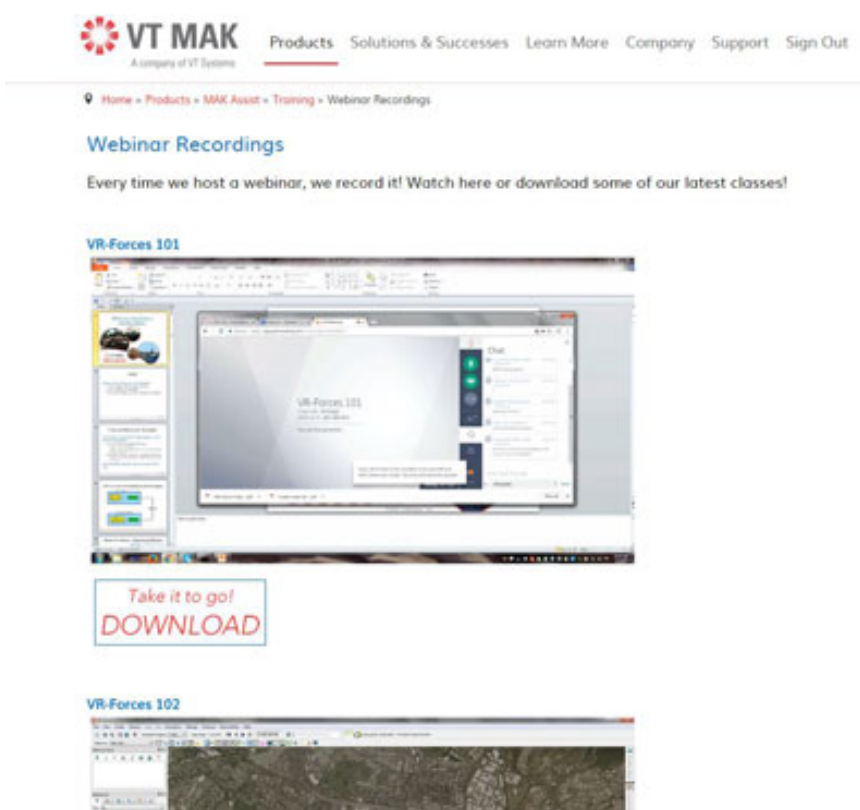
Training Courses

MAKers are diverse, and that diversity extends to the ways we learn. While some of us prefer to meticulously read the user manual before exploring software, others prefer to jump right in and get their hands dirty. We want to create the best experience for everyone, so we offer classes that can get you off the ground and executing plans with an instructor through online webinars and onsite training in Cambridge. Whatever your experience level, usage type, or time constraints, we have flexible training that is curated specifically for your needs.

We offer both online, and on-site training courses to help you get the most out of MAK products. Online courses, presented by our talented engineering staff, provide hands-on instruction to familiarize you with the product's capabilities and user interfaces. We schedule these courses periodically and send announcements to people who register their topics of interest in their online profile. On-site courses go deep and cover all the critical aspects of the product(s). Courses can be held at our facility or yours.

Custom courses can be scheduled at your convenience. We can provide standardized courses, or as is commonly requested, coursework can be customized to address the requirements of a particular program, project, or functional group.

The website features a current listing of upcoming courses, as well as a request form for custom training.



If you miss an online course, recordings are available on our website, so you can catch up at your own speed.

Consulting

When it comes to developing a complex system, sometimes bringing experts in is the best answer. If you're building a system with MAK products, MAK engineers are available to integrate with your team and bring their expertise to your challenges.

Whether your simulation system involves a few computers in one room or thousands of workstations around the world, our experts will help you design an architecture to fulfill your requirements, from initial design through final delivery. We have experience ranging from large scale systems, supporting thousands of computers, to small, embedded solutions.

As a company that actively contributes to the development of distributed simulation standards, we are able to provide guidance on how to best use the different simulation protocols to achieve your goals. Our understanding of the simulation domain and technology allows us to find the right solution for your requirements without restricting us to a single vendor or product, giving you the optimal solution for your budget and long term goals.

All simulations need a terrain database — a place for the simulation to play out. Sometimes it's a challenge to find a terrain solution that meets your project's needs and fits your project's budget. We have terrain databases that you can use for free with MAK products, but when you need a custom terrain solution, MAK is here to help you understand the trade-offs and to help you develop a winning strategy.

There are many strategies for using MAK products as components of your system software architecture. They range from using MAK products out of the box and customizing the terrain, models, or AI. But, our products are designed to also be more deeply integrated, as well. If you would like MAK engineering experts to assist you in choosing the right approach, having us pay you a visit is an extremely efficient way to get started.

Services

If you feel that consulting isn't enough, and prefer to carve off a part of your project and let MAK develop a solution that meets the requirements, we can handle that for you as well. MAK has a long history of delivering on program requirements, from writing a custom plugin for one of our products, to developing a complete solution. We can support you as a partner or sub-contractor during all phases of a program, from pre-sales, through proposals, to design, development and deployment.

With the advent of MAK Assist, we hope that the ways we can help you succeed are more visible than ever. With MAK, you aren't just buying our products – we're becoming part of your team. We call it The Engineer Down the Hall philosophy.

NewsMAKers

Recently, VT MAK attended and exhibited at the Australasia Simulation Congress (ASC) in Sydney, Australia. Check out [Steve Peart's report](#) from the show!

We're announcing new rounds of online and onsite trainings for December and January! [Check out the training page](#) to get the latest schedule, and catch up on any webinars you missed.

We've recently released [VR-Engage 1.1](#) and [MAK Data Logger 5.5](#). Make sure to check out their announcements to find the latest improvements.

We have upcoming events, including I/ITSEC! Check out our [event calendar](#) to see what shows we're attending and what we'll be bringing.