MSIAC M&S Newsletter

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WELCOME TO THE JULY / AUGUST 2012 EDITION *of the MSIAC M&S Newsletter. The Newsletter presents a variety of M&S articles and events from communities enabled by M&S within the Department of Defense and beyond.*

The focus of this issue is on M&S Manufacturing. We present articles ranging from Ford's Virtual Factory to Simulation Stress Operators.

Please note that although the wording in the excerpts may not always correspond to official DoD usage, the full articles available through the links provide valuable insights into significant ways that modeling and simulation helps foster innovation. We hope you enjoy this issue and welcome your comments.

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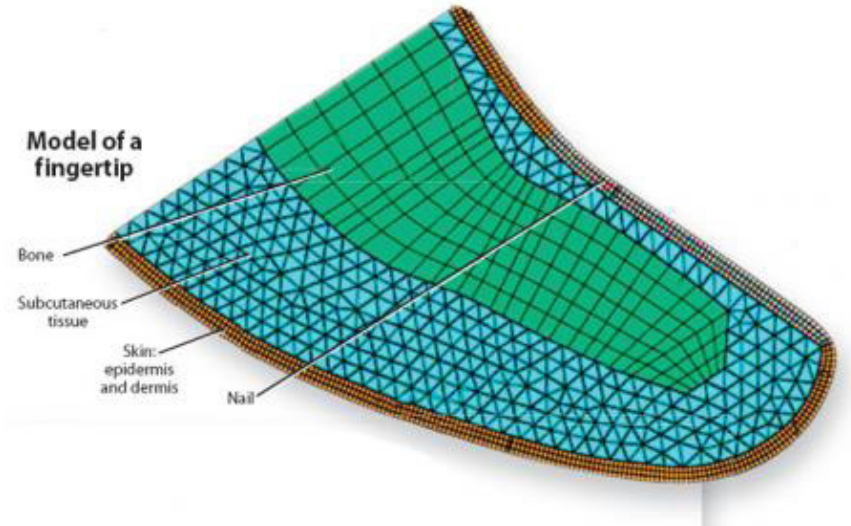

Photo: Provided by MachineDesign.com

ANYONE WHO'S EVER TYPED ON A MOBIL-DEVICE has probably aimed for one letter but hit a different one on a nearby key. The result? Poor spelling, mangled messaging, or an e-mail that never should have been sent. As electronic devices become increasingly compact, "fat-finger syndrome," as it is known in the industry, is becoming a bigger problem.

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FOCUS ON M&S MANUFACTURING

Fat-Finger Syndrome

—continued from page one—

Pad computers and smart phones might have flat touch-screens that work off of pressure sensors, but keypads and keyboards that rely on the touch of a finger on a spring-loaded key are still widely used in many electronic devices such as desktop computers, laptops, some cell phones, remote controls, and appliances.

The Global Production Technology Center of Samsung Co. Ltd., in Suwon, Korea, decided to tackle the problem of tinier keys and denser key layouts to make products that are both smaller and easier to use. Engineers there delved deeper into the fat-finger phenomenon by examining the physics behind keystrokes, finger pressure, and strike angle to determine what can go wrong and how to correct it. The company thinks keyboards will remain widely used for the foreseeable future, so it is important to study the ergonomics of human-device interaction. According to Samsung, using Abaqus finite-element analysis (FEA) for realistic simulations helped engineers cut mistyping errors with a prototype model of a QWERTY keypad. Systematically modifying the relevant design parameters revealed keypad configurations which led to the least number of typing errors.

To tackle fat-finger physics, engineers realized they needed two different FE models to realistically simulate the problem — one of a human fingertip and the other of a device key.

This article by Leslie Gordon, originally appeared on the Machine Design website. For the complete article, **click here.**

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Physical Simulation of Manufacturing Processes at UCT

A THERMAL-MECHANICAL TEST SYSTEM, THE GLEEBLE 3800, has been installed at the Centre for Materials Engineering at the University of Cape Town under the auspices of National Research Foundation special equipment award. The Gleeble 3800, worth $1.05-million, is a fully integrated digital closed-loop control thermal and mechanical testing system, which is able to closely simulate actual industrial metal processes, including hot rolling, forging and extrusion.

The equipment will place the centre at the forefront of research into the behaviour of materials during manufacture, enabling researchers to investigate novel materials processing and the processing of novel materials.

The direct-resistance heating system of the Gleeble 3800 can heat specimens at rates of up to 10 000 ºC/s, or it can hold steady-state equilibrium temperatures. High cooling rates can be applied to quench after testing. The high-compression capacity enables the simulation of the plane-strain condition in the roll-gap during metal rolling and, thus, provides a means to closely simulate the industrial process without the need for costly plant trials.

The research and training of postgraduate students will provide a knowledge base and a core of local expertise in the science that under-pins manufacture.

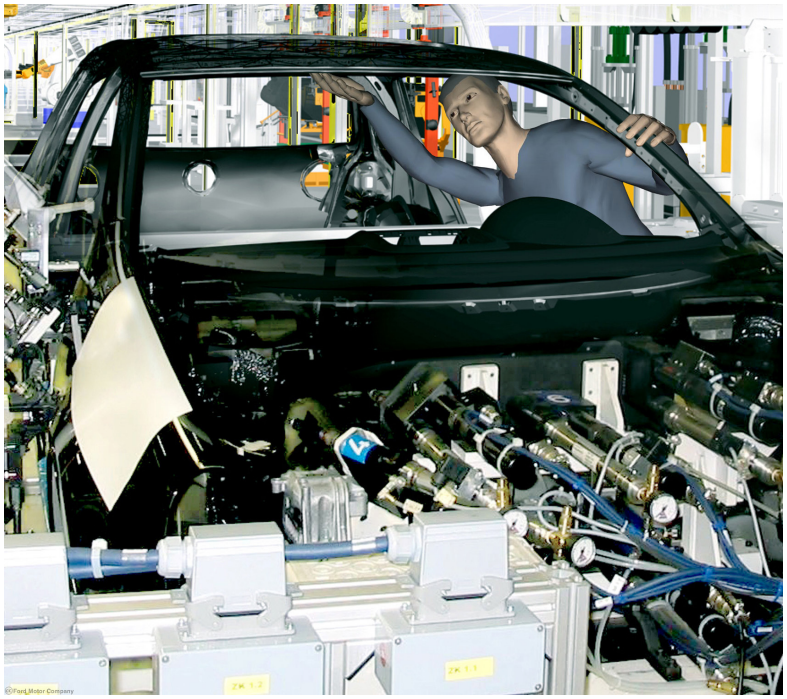
"By emphasising technical innovation in our student training, and interacting with local industries, we will develop skills in innovative manufacturing and production," says Centre for Materials Engineering director Professor Rob Knutsen.

"It will provide opportunities for collaboration with the local metals-producing industries that have not been possible before, owing to the limitations of existing equipment in South Africa. Examples include deformation and recrystallisation texture studies on stainless steels and aluminium, which are critical for developing and producing competitive commodity products.

This article originally appeared on Creamer Media's Engineering News at **www.enigneeringnews.co.za**. *For complete article,* **click here**.

FOCUS ON M&S MANUFACTURING

Ford Creates Virtual Factory to Simulate Assembly-Line Process



A VIRTUAL FACTORY THAT SIMULATES THE FULL ASSEMBLY-LINE PROCESS IS BEING DEVELOPED BY FORD.

In a statement, the company said the facility would help improve quality and cut costs in real-world manufacturing plants by creating and analyzing computer simulations of vehicle production procedures.

"We have already started work on our virtual factory project so that we won't have to go to the real assembly line to conduct tests or research possible plant upgrades," said José Terrades, simulations engineer at Ford of Spain.

"Virtual factories will enable Ford to preview and optimize the assembly of future models at any of our plants, anywhere in the world. With the advanced simulations and virtual environments we already have at our disposal, we believe this is something Ford can achieve in the very near future."

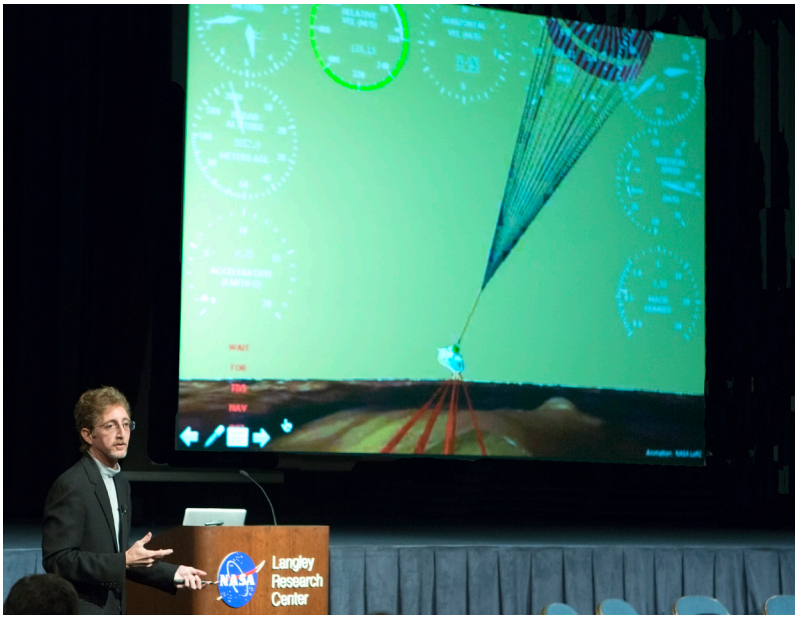
In 1997, Ford was the first car maker to use computer simulations to plan vehicle assembly at facilities worldwide. Computer simulation is now integrated into Ford's development processes.

"The final assembly process simulations we use today allow us to do much more than simply plan our build sequences," said Nick Newman, implementation manager at Ford of Germany. "We can piece together complete cars in a virtual environment and assess the construction down to the finest detail, and we plan to implement this even more widely in the future."

This article originally appeared on TheEngineer.com website. For complete article, **click here.** *For more information on the Ford Virtual Factory, visit:* **http://corporate.ford.com/news-center/press-releases-detail/pr-ford-plans-virtual-factory-for-36862** *© Copyright 2000 - 2012 Centaur Media plc*

Photos: Provided by Ford Press Office

Getting Curiosity to Mars, One Simulation at a Time



THOUGH THE CURIOSITY ROVER is expected to land at approximately 1:31 a.m. EDT, NASA Langley Research Center's role with the Mars Science Laboratory comes into play at about 1:24 a.m., when a complex sequence of events unfolds during Entry, Descent and Landing (EDL). "This landing represents 10 years of work by NASA engineers, people in industry, and people in academia who are very excited to see this spacecraft land," said Juan Cruz, an aerospace engineer. "Among those engineers, there is a team here at Langley that specializes in Entry Descent and Landing, or EDL. Basically what we do is try to land payloads on other planets."

Most recently, the EDL team at Langley celebrated a successful Phoenix landing on Mars in 2008. But with Curiosity being the largest rover ever sent to Mars, the team had new challenges to overcome. On Thursday, some of Langley's MSL team members presented their contributions to employees in the Reid Conference Center.

"If you are going to take such a large rover and put it on Mars, you need an equally large Entry, Descent and Landing system," Cruz said as he displayed a photo of the aeroshell that is taking Curiosity to Mars. "The mass of the whole entry system, meaning the aeroshell, not counting the crew stage and the rover, is 3,300 kilograms. That's a lot of mass, which has to go from 5.8 kilometers per second to zero in about seven minutes."

Langley's EDL team has a reversed role, compared to the launch team.

"One of the things we like to think about that we do here, is people that do the launch vehicle take the spacecraft from the ground and they put all this energy to get it to Mars," Cruz said. "They have about 30 to 45 minutes ... a rather leisurely pace. Then we get to undo their work in seven minutes at Mars. So, we think we work the hard end of the problem."

But with challenges, also came opportunity.

"One of the things that we are very proud of, as far as the EDL team, is that this is the first landed mission on Mars in which we were able to tell the scientists that there were the four sites, and that we could land safely on all four of them. And the decision of which one of the four sites they chose was completely up to them," Cruz said. "We were confident that we could put it wherever they wanted. That has not always been the case."

Ultimately, scientists chose the Gale crater to search for evidence of a past or present habitable environment for life.

"This sequence of events happens 13.5 light minutes away, which means that there are no questions during this period. The spacecraft is completely on its own," Cruz said as an EDL animation played on the big screen. "You can imagine that if you were to design a spacecraft and do nothing more than design it and send it and expect that it would work on the first time, it wouldn't. But the thing is that, in fact, we have done it. We have done it about 10 million times or more over the last 10 years."

One of NASA Langley's major roles has been to create a simulation that looks at everything that could happen, end-to-end, from the moment the spacecraft touches the top of the atmosphere to the time it comes to rest on the surface. Millions of analyses look at all uncertainties in all types of combinations.

This article originally appeared on the NASA, Langley Research Center website. For the complete article, **click here.**

Photo: Provided by NASA Langley Research Center

Army Future Wargame Assesses Ideas and Concepts

THE ARMY CONDUCTED ITS FUTURE WARGAME, Unified Quest 2012, bringing together members of the services, civilians and academics to develop ideas that will drive change and directly affect concept and capability development.

The game, which ran June 3-8, is the primary way the Army Chief of Staff examines what the Army of the future must do and how it will fight.

While the game considers scenarios around the 2020 time period, it is today's environment of steep defense budget cuts, coming force reductions and new strategic guidance that are causing the service to reassess its concepts and requirements.

The game is also timely as the service reconsiders ideas and concepts and lessons learned that have been developed and served the force during two major conflicts over the past decade.

Specifically, participants are assessing the 2009 Army Capstone Concept (ACC), which describes the broad capabilities the service requires to prevent conflict, shape the international environment and win decisively.

A panel will validate a revised ACC during Unified Quest. It will then be reviewed by a Chief of Staff of the Army Monthly Futures Group meeting at the end of the month, and the formal publication of an approved ACC is expected in July.

Additionally, participants are examining the draft Army Operating Concept, which is how the service will actually fight in 2016-2028 as part of the joint force, informing revisions of the functional concepts in the context of the strategic guidance and future-operating environment.

This article originally appeared on the Defense Daily website. For the complete article by Ann Roosevelt, **click here.** *Copyright (c) 2012 Access Intelligence, LLC. All rights reserved.*

Simulation Stresses Operators to Reduce Stress Later

BY MONITORING EVERYTHING FROM HORMONES TO HEARTBEATS as pilots fly simulated UAVs, scientists at the Air Force Research Laboratory hope to improve the tools and techniques used to control remotely piloted aircraft.

The project is running at the Human Universal Measurement and Assessment Network Laboratory, better known as the HUMAN Lab.

With setup behind them, researchers will soon begin collecting data – one gigabyte of it per second – as pilots undertake simulated tasks such as tracking or engaging multiple targets with multiple RPAs. The operators will be watched and tracked by EEG leads, eye-trackers, galvanic skin-response sensors, voice stress analysis tools and brainwave monitors.

Scientists can then examine when a person becomes overly stressed or unable to correctly execute his or her mission, according to Scott Galster of the applied neuroscience branch at AFRL.

Developers and trainers can use this information to design better equipped command stations or suggest techniques that operators can use to compensate.

Galster's hypothesis is that although the experienced pilots will be able to juggle more remotely piloted aircraft, they will eventually succumb to overload just as newer operators do.

"It's not how many – it's how complex those things are," Galster said. "Some people will go under with one, because that mission is too complex. I could do a swarm of 50 if nothing is going on, because it's just monitoring."

The information from various sensors is translated to one readable language – with time stamps and proper coding – by Aptima's PM Engine. Historically, Galster said, scientists have focused on one or two sensor sets.

This article originally appeared on the Training and Simulation Journal (TSJ) website. For the complete article, **click here.**

Virtual Reality Used to Train Soldiers in New Training Simulator

THE ARMY IS RESPONSIBLE TO PROVIDE REALISTIC TRAINING for individual Soldiers while mitigating risk. With emerging technology of the virtual world, this is becoming a reality.

The first-ever, fully immersive virtual simulation training system for Soldiers is being fielded at Fort Bragg. The Dismounted Soldier Training System will be available for leaders to enhance their Soldiers' training in a fully immersive, virtual reality environment.

This virtual system allows leaders at the squad level to maintain their squad's proficiency of their assigned tasks in a timely and safe manner, even in the event new Soldiers arrive to the unit.

"This system gives the power of simulation to the squad in order to close the gap of individual Soldier training and collective training," said John Matthews, project director, Assistant Project Manager for Close Combat Tactical Trainers. "This system enhances training; it does not replace it."

The ability to train with this system allows the "reset" time to be cut down, which allows the ability to get more repetitions in a shorter amount of time and the ability to review each mission on a television screen to enhance the after action review process upon completion of each mission. "You can mold the situation, and you can do it as many times as you want and give younger guys a chance to step up and be leaders. I can see us in the future using this system to conduct rehearsals," said Sgt. Charles Haywood, team leader, 1st Battalion, 505th Parachute Infantry Regiment, 3rd Brigade Combat Team, 82nd Airborne Division.

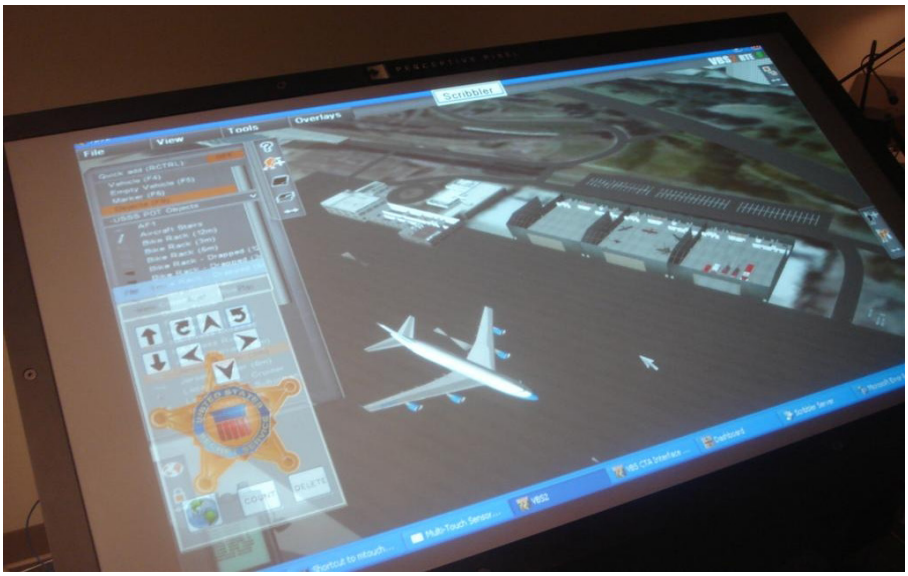
With a wide variety of environments, and the ability to insert specific entities into the scenarios, the options for training opportunities are virtually limitless; rehearsals for missions or live-fire exercises are just a couple of examples.

Currently, the programmed training environments include mountainous, wooded, and desert. These are intended to simulate places like Afghanistan and Iraq, but are not limited to only these specific scenarios.

This article originally appeared on the United States Army website. For the complete article, **click here.**

Photo : Provided by Army.mil

Secret Service's Virtual Site Security Planning



CHEMICAL RELEASES, SUICIDE BOMBERS, AIR AND SUBSURFACE THREATS. Now, with the help of the Department of Homeland Security's Science and Technology Directorate (DHS S&T), the Secret Service is giving training scenarios a high-tech edge: from static tabletop models to virtual sites with gaming technology and 3D modeling.

The training center wanted to make these scenarios for both recruit and in-service training more current and flexible by going beyond a static environment to encompass the dynamic threat spectrum that exists today. The Secret Service's Security and Incident Modeling Lab (SIMLAB) developed a planning and training system by:

— Using the serious game, Virtual Battle Space 2 (VBS2)

— Engaging the Applied Research Lab at Penn State University to create a custom touch interface (dashboard) and free-hand drawing tool, called Scribbler

— Making the physics-based chemical plume cloud dispersion model, CT-Analyst by Naval Research Lab, interoperable with VBS2

— Integrating health effects data for specific chemical agents into CT-Analyst, modeled by Gryphon Scientific, Inc.

— Tying-in the external simulated artificial intelligence program, Civilian Activity Modeling for eXercises (CAMX) from Canadian Forces R&D, to populate the virtual scene with civilian clutter (non-playable characters)

— Enhancing CAMX with additional automated behaviors representative of civilian crowd dynamics.

Site Security Planning Tool (SSPT) is the touch-based system developed for the Secret Service's training center. It consists of touch kiosks, each comprising a 55" Perceptive Pixel touch display housed on a pedestal with a computer running VBS2 as the primary simulation. Each kiosk accommodates a team of four students who are developing a security plan for their assigned site. Each kiosk's virtual site, along with the team's crafted site plan, may be projected on a large screen for class briefings and to observe the outcome of scripted game vignettes that challenges the team's security plan, highlighting site and plan vulnerabilities as teaching points. In-service employees also utilize SSPT for more advanced training scenarios. For more information on SSPT, you may contact Mark Harmon, SIMLAB, at **mark.harmon@usss.dhs.gov**.

This article contributed by Mr. Mark Harmon, Security and Incedent Modeling Lab (SIMLAB), U.S. Secret Service, U.S. Dept. of Homeland Security.

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Photo : Provided by Mark Harmon

ODU M&S Research Team Develops Tool & Training Simulator for Pediatric Surgery

MODELING AND SIMULATION RESEARCHERS at Old Dominion University have teamed up with surgeons from Children's Hospital of The King's Daughters (CHKD) to continue a legacy of innovation that has made Norfolk the top location in the world for the treatment of a common chest deformity in children.

Pectus excavatum, Latin for "hollowed chest," causes several ribs and the sternum to grow abnormally. This produces a caved-in or sunken appearance of the chest, which can be present at birth or not develop until puberty.

Surgical correction of pectus excavatum was a complex and somewhat brutal procedure until CHKD surgeon Donald Nuss developed a minimally invasive technique to correct it in the 1990s. In the Nuss Procedure, which is now used around the world, the surgeon threads a curved metal bar under the sternum to push it out into a normal position.

The bar is then anchored to the ribs and remains in place for approximately two years so the chest wall can harden in its new position. Then the bar is removed during a second surgery.

Nuss is now retired from CHKD, but his partners there and at Eastern Virginia Medical School continue to refine the procedure he developed and are currently collaborating with modeling and simulation researchers from ODU to do two things - design a new device to improve the procedure, and develop a hands-on simulation to train physicians to perform it safely.

Rick McKenzie, professor of modeling, simulation and visualization engineering in ODU's Frank Batten College of Engineering and Technology, is the principal investigator on a study to develop a tool to improve the process of extracting the metal bar during the second surgical procedure.

The tool - developed with Sebastian Bawab, professor of mechanical engineering; doctoral engineering student Krzysztof Rechowicz; and Dr. Robert Obermeyer of CHKD - is designed to make the extraction of the bar simpler and quicker.

In doing research for a device to help with the extraction, the ODU group wanted to look at the reason for the deformity, by determining the tissue properties of the pectus excavatum cartilage in vivo from current patients. That information will help in further understanding why the deformity occurs and how it can best be treated, McKenzie said.

This article originally appeared on the VMASC Old Dominion University website. For the complete article, **click here.**

Sims Aren't Just for Flying Anymore

OFFICIALS WITH THE 337TH TEST AND EVALUATION SQUADRON here, through a cooperative program with the U.S. Air Force Academy, is developing a computer-based simulator program that will allow leaders to make more informed decisions regarding resource allocations.

The program allows a user to input changes in resources and manpower to project effects on the B-1 Lancer community, enabling better analysis for leaders.

"Our model allows us to adjust things and see how the B-1 community reacts to decisions, like the way we assign instructors to different squadrons or the amount of sorties we generate," said Maj. Jeffry Moffitt, the 337th TES assistant director of operations and project lead. "For example, you can vary the rate of aircraft available and run experiments to see how many people you need to put through the school now that you have fewer aircraft to fly."

Second and third order effects are also a piece of the puzzle, Moffitt said.

"If I put fewer people through the formal training unit now, how many instructors do I need in the schoolhouse and how many do I need in the bomb squadrons?" he said. "If I put more people through the FTU, I may need more instructors at the FTU."

As an example, he explained how the schoolhouse feeds into the 34th and 37th Bomb Squadrons at Ellsworth Air Force Base, S.D., and the 9th Bomb Squadron here.

"If you turn up the resources you allocate to the schoolhouse, you'll get a big flow of people from the schoolhouse to the squadron," he explained. "But if you've taken resources away from the squadron, they may stagnate there a little."

This article originally appeared on the United States Air Force Website. For the complete article, **click here.**

M&S WHAT & WHEN

MODELING & SIMULATION CALENDAR OF EVENTS

For a complete list of upcoming events, please visit the MSIAC website at

www.dod-msiac.org/calendar.html

Fall Simulation Interoperability Workshop (SIW)
September 10 – 14, 2012
Orlando, Florida

iSummit 2012
September 17 – 18, 2012
Orlando, Florida

European Modeling and Simulation Symposium
September 19 – 21, 2012
Vienna, Austria

Modeling and Simulation Multi-Con
September 25 – 27, 2012
Suffolk, VA

15th Annual Systems Engineering Conference
October 22 – 25, 2012
San Diego, CA

2012 Autumn Simulation Multiconference
October 28 – 31, 2012
San Diego, CA

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