

is

“Synthetic Training”

real training or not?

“Synthetic” is Widely Used in the Context of Military Training



Joint Strike Fighter Synthetic Training

'Live synthetic' Army's next generation of simulation

March 19, 2014

By David Vergun

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Live synthetic is the Army's next generation of simulation.



EWTGLANT

Expeditionary Warfare Training Group, Atlantic

Impetus e Mari Attack from the sea

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FLEET SYNTHETIC TRAINING (FST)

Home » Newsroom » Feature Stories » Leidos Allies With U.S. Navy for Fleet Synthetic Training Exercises

Leidos Allies With U.S. Navy for Fleet Synthetic Training Exercises



Through synthetic training — a predeployment, virtual training program — the Navy now trains its sailors in a low-cost, repeatable environment to their individual requirements.

HOME > AWIN ONLY > RAF WANTS TYPHOON SYNTHETIC TRAINING TO BE ON PAR WITH F-35

RAF Wants Typhoon Synthetic Training To Be On Par With F-35

Tony Osborne | AWIN First

May 15, 2014

EMAIL SHARE Tweet Recommend 40

COMMENTS 0

QinetiQ | Services & Products | Training | Synthetic Environment Training

Synthetic Environment Training

QinetiQ's synthetic environments enable forces to practice tactics, techniques and procedures prior to deployment.



Realtime Synthetic Environments

Do Words Matter?

What is Real?



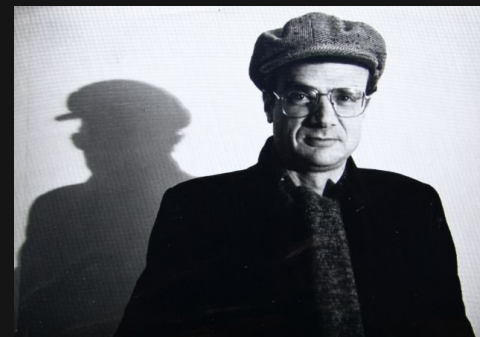
but it's the after lunch time slot



A Synthetic Shark?

- “In an age of synthetic images and synthetic emotions, the chances of an accidental encounter with reality are remote indeed.”

– Serge Daney (1944–1992) - French film critic - 1992



What is “Synthetic”?

- Origin Ancient Greek συνθετικός (*sunthetikós*)
“to put together”
- Definition (Adjective)
 1. made from artificial materials or substances, not from natural ones
 - synthetic fabrics
 - synthetic hormones
 2. false, or not real
 - their apparent friendliness is completely synthetic

© Macmillan Publishers Limited 2009–2014

is
Synthetic Training
“false, or not real”?



I am not a
fan of the
word
“synthetic”

All training
must be real

Synthetic Implies Second Best?

does it matter?

Where is the Human?



SMi 3rd Annual Military Flight Training Conference
London – 22/23 September 2014

is

“Synthetic Training”
real training or not?

Andy Fawkes

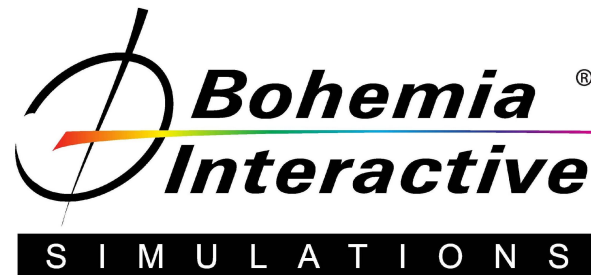
Presentation Outline

- **Synthetic Origins**
- **My Simulation Policy Journey**
- **What will be Real?**

My Background



THINKE



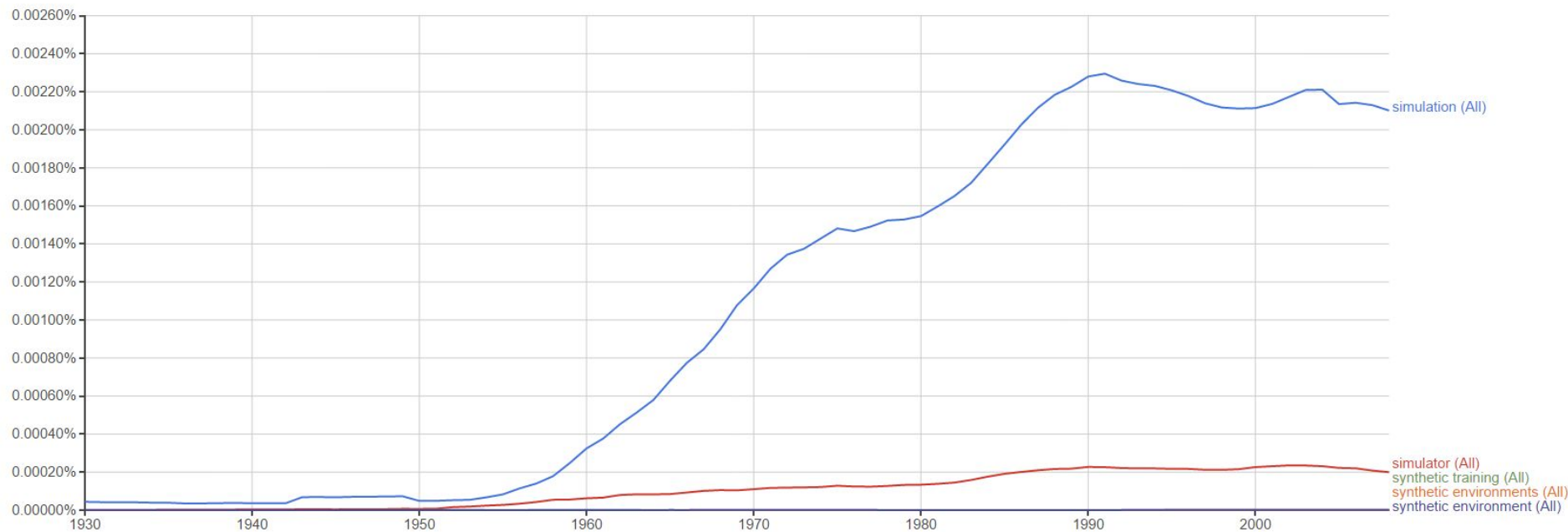
Synthetic Origins

References to Synthetic Training & Simulation

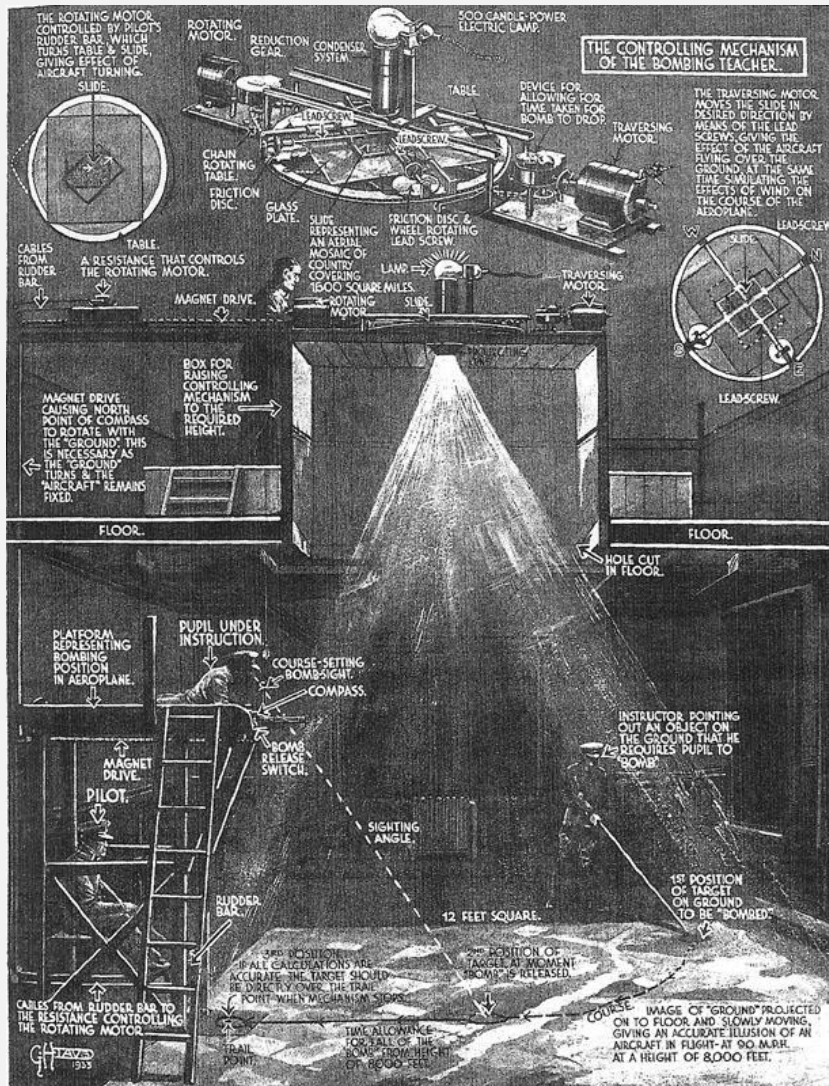
Google books Ngram Viewer

Graph these comma-separated phrases: simulation,simulator,synthetic training,synthetic environments,synthe ☒ case-insensitive

between 1930 and 2008 from the corpus English with smoothing of 3 [Search lots of books](#)



Vickers-Armstrong Bombing Teacher - 1934



Link Trainer - 1934

SKY TRAILS in a LINK TRAINER

Perfection in Instrument Flying and Radio Navigation Technique can be attained quicker, safer, and more economically in the LINK INSTRUMENT FLYING TRAINER



DEVELOPED AND MANUFACTURED BY
LINK AVIATION DEVICES, Inc.



are faithfully and accurately traced on a map or chart by the Automatic Recorder on the Instructor's Desk



Every Aviation Cadet receives Instruction in the LINK TRAINER

SIR ARTHUR T. HARRIS

Despatch on War Operations

23rd February, 1942

to 8th May, 1945



Synthetic Training

- “These ingenious synthetic training devices which were involved during the war to assist in training deserve for mention.
- The object of synthetic devices is not so much to shorten the time spent on training in the air.. but rather to ensure that by careful preparation on the ground the maximum possible use will be made of the air time available, thus reducing the number of repeat exercises or failures ..
- Nearly all synthetic devices started life in holes and corners .. but when gradually the necessity for all these devices was recognised ... suitable buildings were especially erected to house the various types of synthetic training equipment.”

"Synthetic Training" Origins

October 21, 1944

The **Billboard** SEPTEMBER 30, 1944 25 Cents

THE WORLD'S FOREMOST AMUSEMENT WEEKLY

GENERAL NEWS

October 21, 1944

The Billboard

AMUSEMENT MACHINES

69

REPORTS STORY OF TRAINERS

How Air Corps Train Gunners

Devices with coin machine background do big training job in Southern camp

BATON ROUGE, La., Oct. 14.—They've taken the juke machines, rattle-dance pinball gadgets into which millions of good American nickels were poured before the war, made them respectable with a new coat of paint and a few ingenious changes and sent them off to war. It's hard to believe that these machines could fit any place in the war effort. But they are doing a mighty important job.

At Harding Field and other Army Air Forces training stations these espin ballers are contributing greatly to the air forces' gunnery training program. Early in the war commanders in the various theaters were crying frantically

Special Tribute

The accompanying article on the contribution coin machines have made to the training of men in the services was published in The New Orleans Times-Picayune September 27. It bore the title of "Juke Box Plays a Martial Role" and is reprinted in full by special permission.

The article is in the form of a letter to the editor and apparently was written by a staff reporter. It was illustrated by two photographs of the air gun trainers in use.

how difficult it is to hit a target traveling at 300 miles per hour.

Realistic Work

The queens of the Synthetic Training Section at Harding Field are two big air-gun trainers, which are so realistic that some trainees do everything expected of air sickness after a few minutes of simulated flight. Sheltered in a large tunnel-like structure, sealed off completely from the light, the trainees do everything expected of a plane except take off and barrel roll. When in operation

Federal Tax Gains in La.

Collections from July 1 to October 1 show gains over same period last year

NEW ORLEANS, Oct. 14. — Louisiana gaming devices, mostly slot machines, paid the federal government more taxes for the July 1-October 1 period this year than they did during the entire fiscal year 1943-1944, according to records of J. C. Fernandez, collector of internal revenue.

The records showed that revenue for the three-month period this year totaled \$808,634.63, compared to the previous fiscal year total of \$703,196.90. "Such an increase is unprecedented," Fernandez said, "and while part of it may be attributed to the enforcement drive conducted by this office during July and August, most of it undoubtedly is due to the increase in the number of slot and

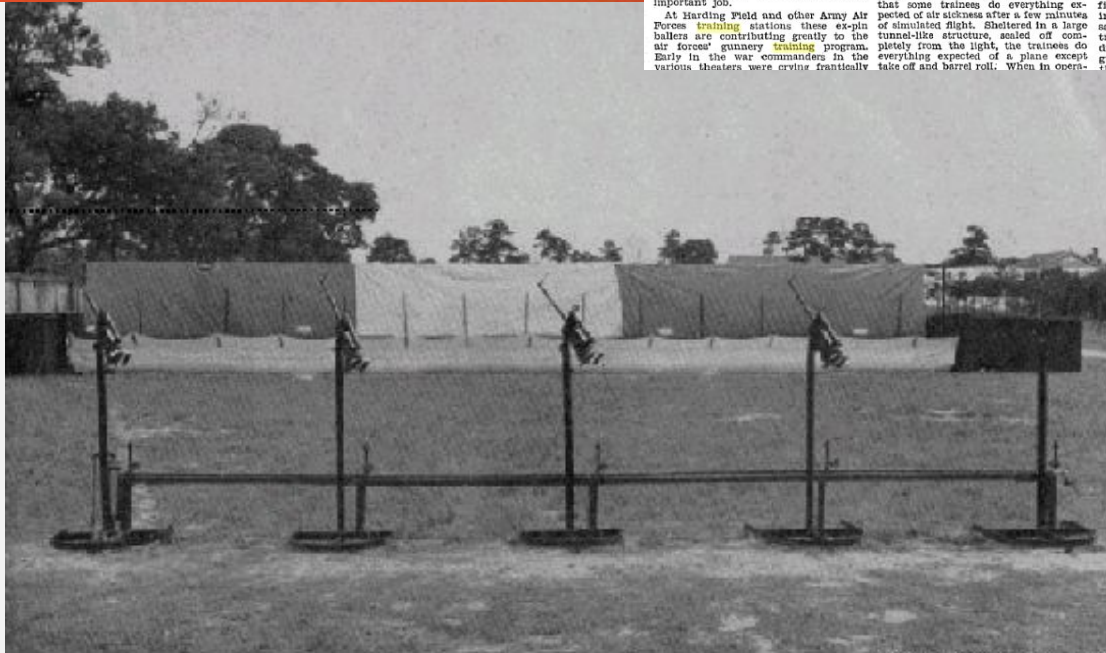
READY FOR LOCATION

IMMEDIATE SHIPMENT

ONE BALLS
1 1/4 Derby \$900.00
2 Sun Anita 275.00
1 Dust Whirls 225.00
1 Whiteway 425.00
2 Fortunes 275.00

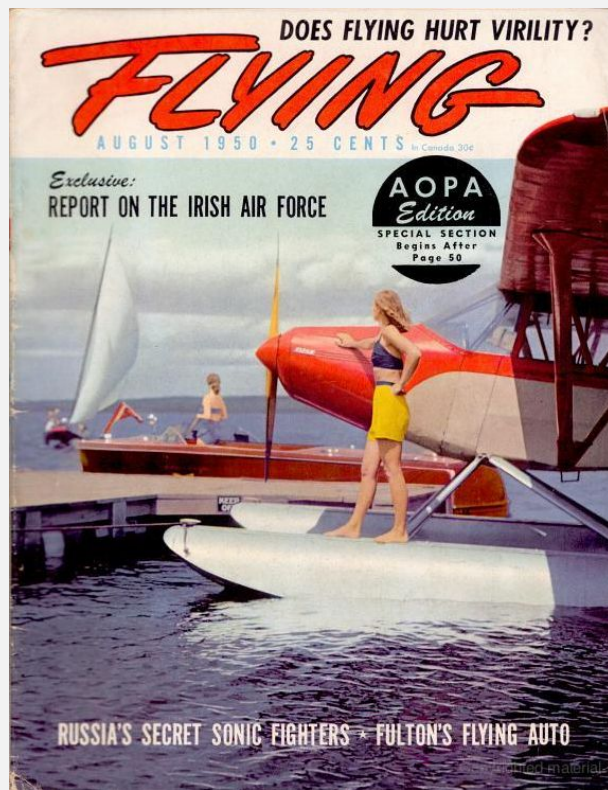
CONSOLES
4 Four Ball, Hi Hand, Late 4-5c \$850.00
2 Jumbo Parades, Cash, Late 175.00
2 Jumbo Parades, Free Play 75.00
1 High Hands 150.00
1 Super Bell, 5c 275.00
1 Prices Races, Brown Cabinet, Cash 150.00
1 Silver Moon, Free Play 85.50
2 Jennings Four Times 50.00
1 Sarratoga, Rails, Cash 85.00
2 Jennings Daily Double 25.00
1 Scheme Bell 75.00

SLOTS
4 Blue Fronts, 5c \$150.00
1 Blue Front, 50c 475.00
1 Blue Front, 25c 325.00
1 Blue Front, 10c 175.00
1 Jennings Chief, Late 5c 110.00
1 Roman Hand, 5c 125.00
1 Malen Bell, 5c 175.00
1 Brown Front, 5c 225.00
1 Waiting Rolltop, Cherry 5c 100.00
2 Waiting Rolltop, 5c Mc Friend 75.00
1 Silver Chrome, 10c 400.00
1 Gold Chrome, 10c 375.00
1 Bonus Bell, 5c 250.00
1 Bonus Bell, 10c 275.00
1 Columbia Bell, 5c 50.00

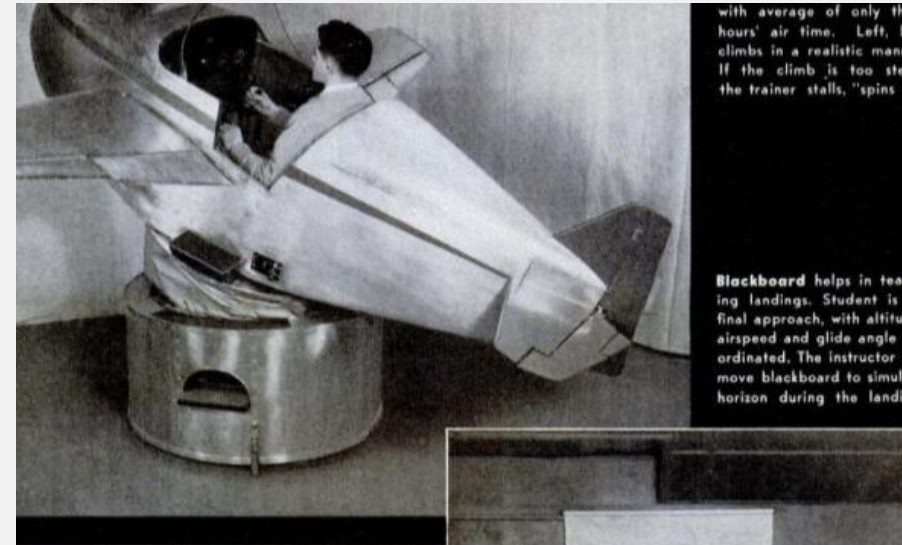


USN courtesy of Jon Moran

The five-gun range at NAGS Pensacola, using MacGlashan mounts.



“Synthetic Training” Origins



New Link trainer allows solo in only three hours' flight time.

FLIGHT STUDENTS at the University of Illinois have been soloing with less than three hours of flying time. A student recently was turned loose after he'd spent only 1 hr. 45 min. in the air.

We've even had the nerve to send some boys up for the private pilot test after less than 10 hours of flight instruction. And one student passed his test for a private license after 7 hr. 25 min. of flight time! We ran him in on a flight exam given by a CAA aviation safety agent under the guise of cross-checking to see if our own flight examiners were doing a satisfactory job. The agent gave him a grade of 78 and started to type out the private ticket before we confessed. He almost fainted when told the student had a grand total of 30 minutes' solo time!

These experiments were part of a general research program in pilot training, under way at the University of Illinois for nearly three years.

We have discovered we can teach the average student pilot enough to pass his private pilot flight test in about 10 hours of flight training plus 10 hours of School Link

training. The School Link, built by Link Aviation, Inc., of Binghamton, N.Y., is a **synthetic training** device that plays a large part in our accelerated training program. Using it, our students should either receive their ratings at the end of 20 hours or should be allowed to use the remaining 15 hours required by law to gain information and experience regarding the utility and economy of the personal plane as a means of transportation.

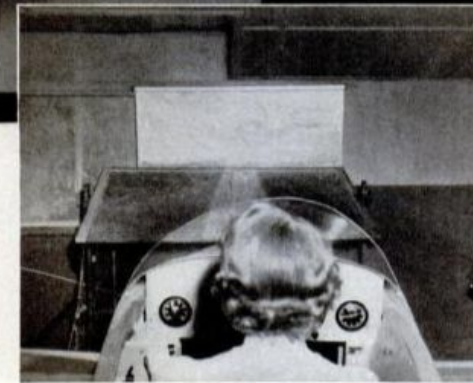
We're now reorganizing our Private Pilot Flight Course—and we'll seek CAA approval for a course consisting of about 10 hours of fundamentals on the ground in the School Link, 10 hours of concentrated flight training in conventional air work, and 15 hours of cross-country and night flying, radio work, actual flight plan filing, and the use of airways and aids to navigation. We also plan to give one trip under the hood—to show the students that new pilots can't fly by instruments alone.

The School Link is a modified model of a preflight trainer. It's made of aluminum, and resembles an all-metal, open-cockpit, mid-wing [\(Continued on page 61\)](#)

Short-Cut to Solo

LESLIE A. BRYAN

Dr. Institute of Aviation
University of Illinois



“Synthetic Training” – 1960

- Synthetic training as “detour training”, a representative only training experience that leads back to improved skills for the actual job

Symposium on Air Force Human Engineering, Personnel
and Training Research 1960

SIMNET Vision - 1978

Networks of simulators that would be used for combat planning, rehearsal, and execution

1



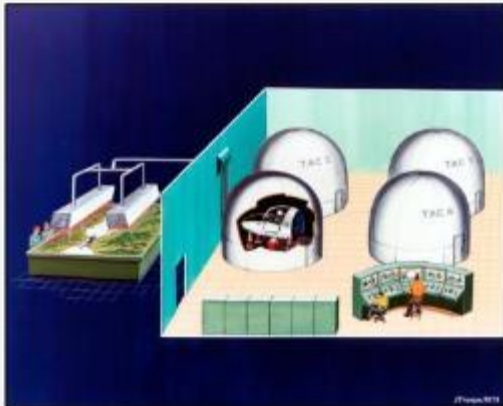
Enemy aggression detected

2



Planning a response

3



Rehearsal and analysis

4



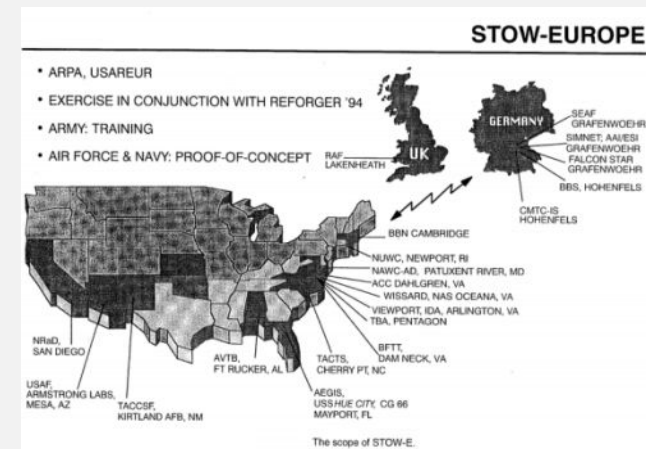
Real time mission observation

1970s - “Future Views: Aircrew Training 1980-2000”

- "advances which are seen on the horizon are not simple improvements in teaching techniques or higher fidelity simulators, but rather bold concepts which tightly align training systems with real combat readiness and make them indistinguishable."
 - 1978, Captain Jack A. Thorpe, US Air Force Office of Scientific Research

US Synthetic Theater of War (STOW)

- The ARPA STOW program was recommended by US Defense Science Board in 1992
- The objective was to link several instrumented training and test ranges with simulator sites to test proposed weapons and joint warfare doctrine using live, constructive, and virtual simulation.
- The first, Synthetic Theater of War-Europe (STOW-E), was conducted in 1994



Synthetic Environments (SEs)

- US –SE is the virtual terrain, and
- A synthetic environment is a computer simulation that represents activities at a high level of realism, from simulation of theaters of war to factories and manufacturing processes. These environments may be created within a single computer or a vast distributed network connected by local and wide area networks and augmented by super-realistic special effects and accurate behavioral models. **SE allows visualization of and immersion into the environment being simulated.**
 - Department of Defense Modeling and Simulation (M&S) Glossary", DoD 5000.59-M, Department of Defense, 1998
- UK - Synthetic Environments (SEs) link a combination of models, simulations, people and real equipments into a common representation of the world **providing consistency and concurrency across previously discrete activities.**
 - 3rd International Synthetic Environment Conference 2000

SYNTHETIC WRAP: QINETIQ ENHANCES THE REALISM OF ARMED FORCES TRAINING

Matt Wright, Head of Business (Land), QinetiQ Training

Imagine being part of a team of young professionals who regularly work overseas with the British Army in places as far afield as Kenya or Canada, living exactly as they do – sleeping in tents, using solar showers – and being an intrinsic part of their highly realistic training exercises. That’s exactly what QinetiQ’s Synthetic Wrap team does.

Truly realistic training ideally requires the use of operational assets, such as unmanned aerial vehicles or fast jets. This isn’t always practical or affordable, so QinetiQ’s solution – Synthetic Wrap – uses simulation technology and expertise to make training even more effective.



Synthetic Wrap - 2000s

SYNTHETIC WRAP

Live-Virtual-Constructive is a much abused term. H4-Global knows the training need, so the solutions we deliver with our partners is innovative yet credible and gives the trainee(s) on the ground the ability to interact with niche capabilities in novel ways. Repetition in an operational context reduces speed to competency.

Now we are in the simulation epoch, you can chose the software appropriate to your training. All of our solutions are software agnostic; you buy the licences, we'll provide your exploitation ability.

Simulation in the hands of the user.



[HOME](#) > [AWIN ONLY](#) > [RAF WANTS TYPHOON SYNTHETIC TRAINING TO BE ON PAR WITH F-35](#)

RAF Wants Typhoon Synthetic Training To Be On Par With F-35

Tony Osborne | AWIN First

May 15, 2014



EMAIL



SHARE



Tweet



g+



Recommend

40

COMMENTS 0



Eurofighter

LONDON — The U.K. Royal Air Force (RAF) wants to upgrade its synthetic training for the Eurofighter Typhoon to be on a par with that expected for the Lockheed Martin F-35 Joint Strike Fighter when it arrives in 2018.

The RAF's Typhoon force is exploring a range of options to get more out of its training and

limited flying hours as it faces airspace constraints, high operational costs and the need to learn how to fly in large-scale operations.

"To go out and employ the large formations we need to train is becoming more difficult, as the aircraft and missiles become increasingly complex and demand increasing amounts of airspace to train effectively. This is why we are exporting that training into the synthetic domain," explained Air Vice Marshal Gary Waterfall, the U.K.'s Typhoon Force Commander, in an interview with Aviation Week.

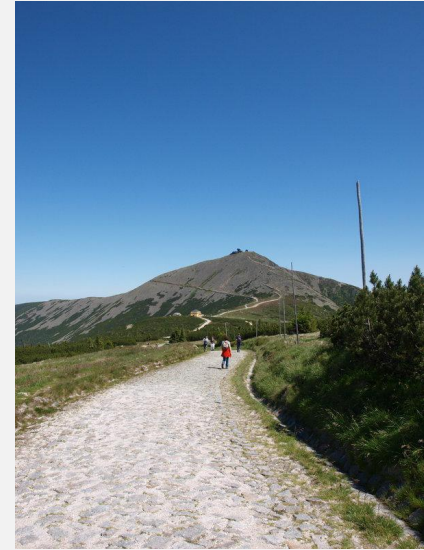
"We have be going through a revolution in synthetic training and realizing that if we want to be good at our game, then a lot of the time we are going to get most benefit from flying in the simulator than in the air."

"Synthetic Training" - Alive & Kicking – 2014

My Simulation Policy Journey

My Simulation Policy Journey

- 1999 - UK MoD SE Policy
 - Promoting Reuse and Credibility
- 2003 - JSP Instruction
 - Promoting Sim/CIS Interoperability and HLA
- 2004 - NATO Games Workshop
 - The rise of Games in Simulation
- 2005 – Common Simulation Infrastructure
 - Project funding line established
- 2008 - UK MoD Simulation Strategy
 - Common Network, Open Standards, use of COTS/GOTS
- 2010 – SDSR
 - Targets to Transfer Live Training to Simulation
- 2012 - Defence Training & Education Capability
 - The rise of the iPad et al in training, common catalogue



2004 – NATO Games Workshop



NATO Modeling & Simulation Group

“Exploiting Commercial Games for Military Use”

October 20-21 2004
TNO, The Hague, Netherlands



Aims

- *UK MoD led, hosted by Netherlands (TNO)*
- Share national experience
- Identify:
 - best practice
 - Lessons learned
 - barriers to further exploitation
 - Areas for collaboration
- Networking:
 - Research community
 - Military
 - Internationally



What Makes a Game Useable?

- At least some of the following:
 - Robust user community.
 - Multiplayer functionality.
 - Scenario creation.
 - Open database.
 - After Action Review.
 - Developer engagement.
 - Validation and accreditation.
 - Support.
 - Use elsewhere - and for what.
- ADSO evaluates games against following "Six Criteria"
 - 1) User Requirement
 - 2) Representations
 - 3) Data availability and reliability
 - 4) Technology
 - 5) Confidence building approaches
 - 6) Cost/benefit



Dutch Perspective

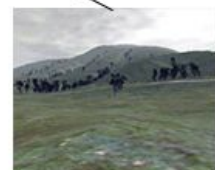
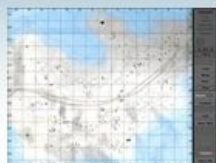
Netherlands Aerospace Laboratory NLR

Flight Simulation Games and their Training Value



Infantry Cognitive Skills Training

Experience Leads to Better War Fighting



INSTINCT

INSTINCT = GHOST RECON + French Improvements

- INSTINCT exercises are defined according to the same process as field exercises
- AAR due to GHOST RECON particularities is only limited to replay the exercises
- Less than 2 hours INSTINCT tutorial prior exercises
- Short drills (4 Hours)
 - To learn procedures
 - Get the know-how
 - React with reflexes



"DIVE 2"

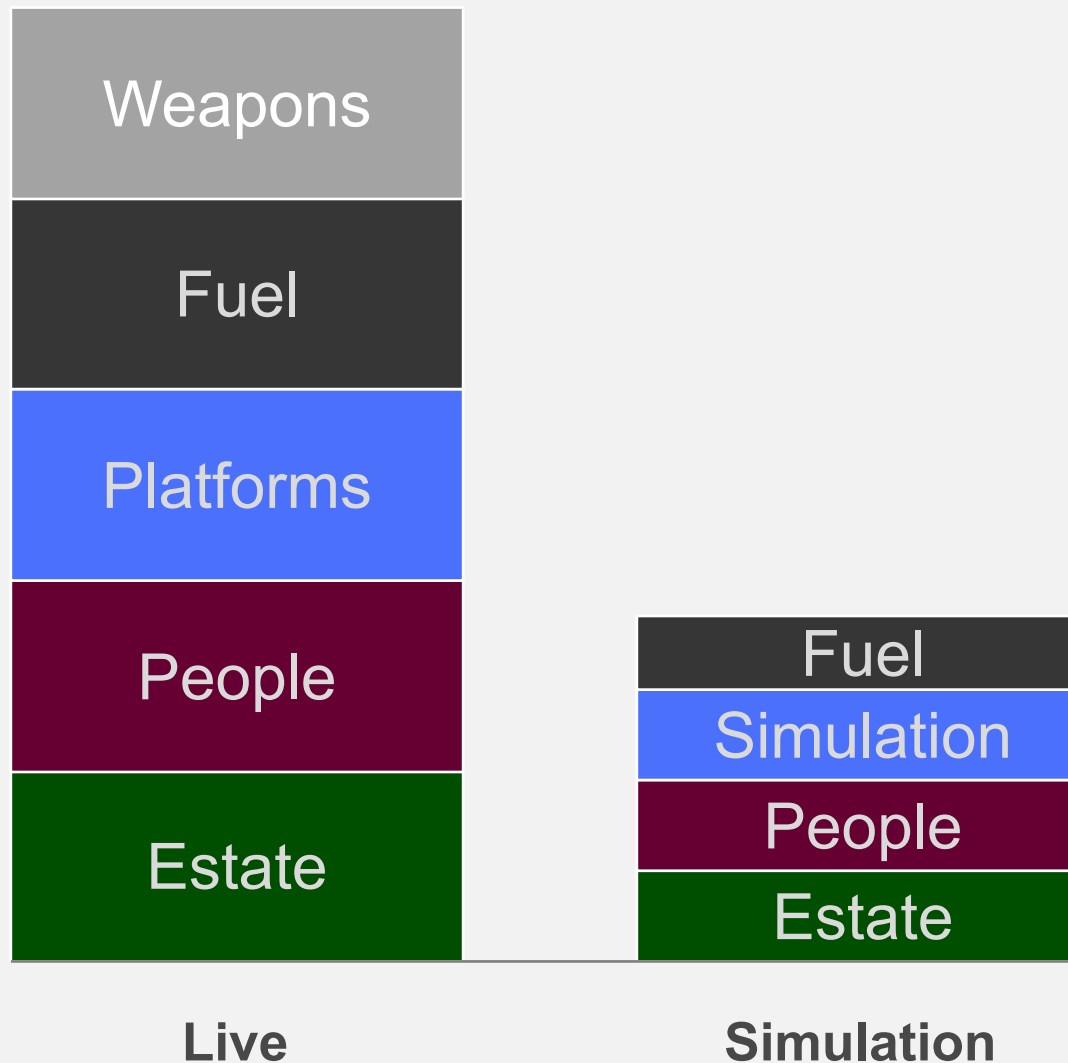
Copehill Down

2008 - UK MoD Simulation Strategy

- Promoted more reconfigurable and adaptable simulation to meet **changing operational needs**
- Drove a common simulation services and infrastructure approach for improved **through life cost effectiveness**
 - A common network
 - Open standards and architectures
 - Common requirement statements in acquisition
 - Maximum use of COTS and GOTS technology
 - Maximum use of common services



2010 – Strategic Defence and Security Review (SDSR) - Cost of Training



2010 - How much?!

- “Cost Simulation 20% of Live Training”

£

- “Save £100m’s”

?

\$

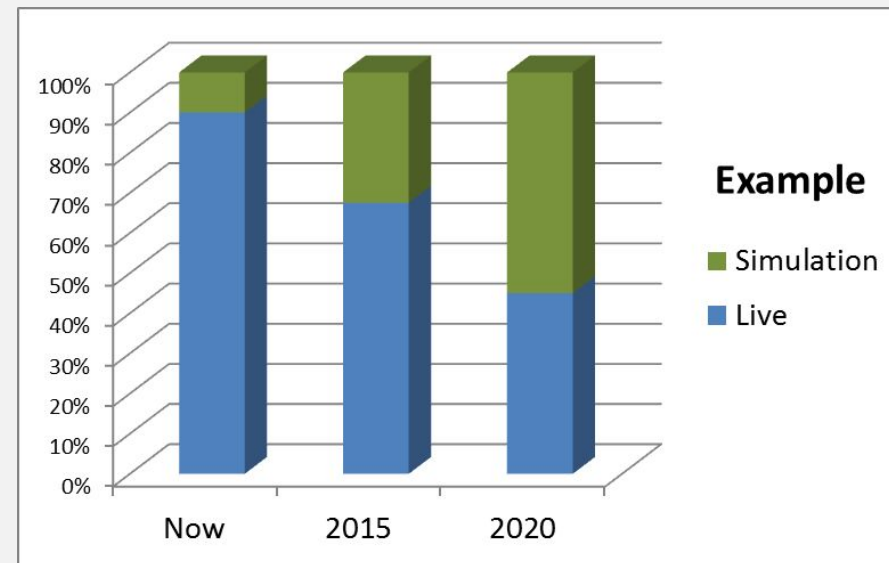
- “Cost Simulation 5% of Live Training”

- “Training 20% of Defence Budget”

€

2010 - SDSR 9.2 Targets

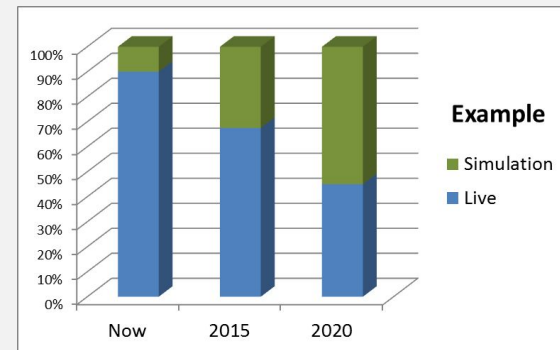
- Step Change in Exploitation of Simulation for More Cost Effective Training
- 25% Transfer Current Live Training to Simulation by 2015
- Further 25% Current Live Training to Simulation by 2020



SDSR 9.2 Targets

Right or Wrong?

They are Still Being Talked
About



2012 – Defence Training & Education Capability Balance of Investment - Choose One or Both?



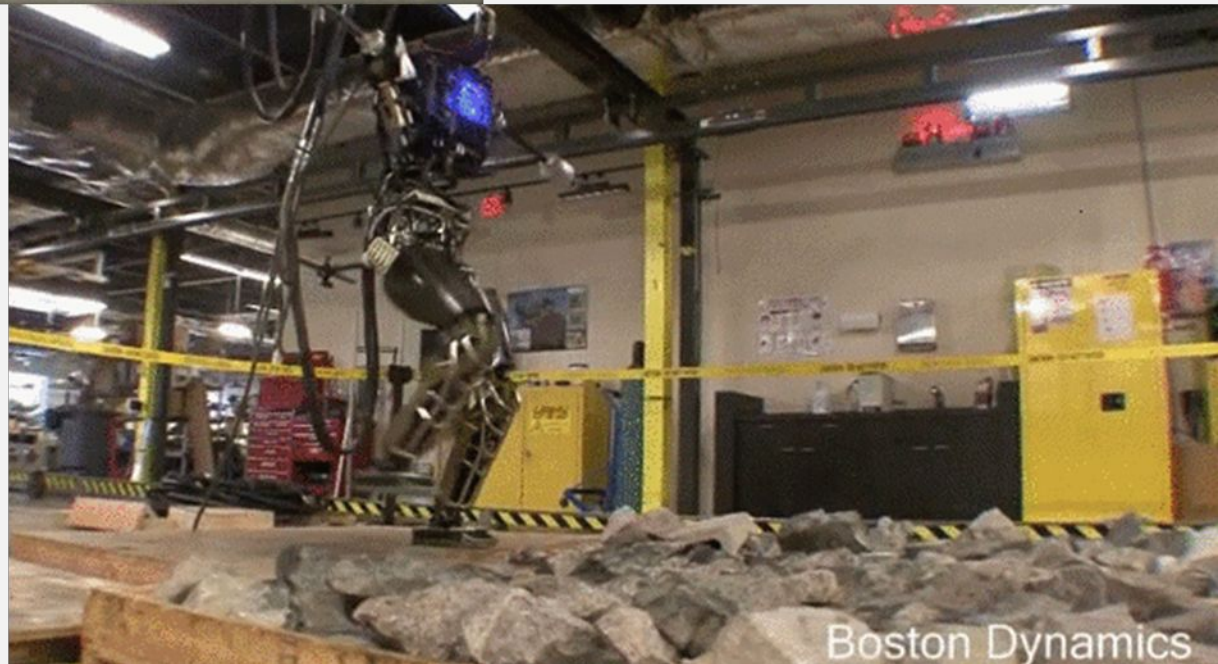
What will be Real?





Simulation

Robotics



Boston Dynamics

<http://youtu.be/AuM1CneGQ4M>

<http://www.youtube.com/watch?v=SD6Okylclb8&list=UU7vVhkEfw4nQGp8TyDk7RcQ&feature=share&index=3>

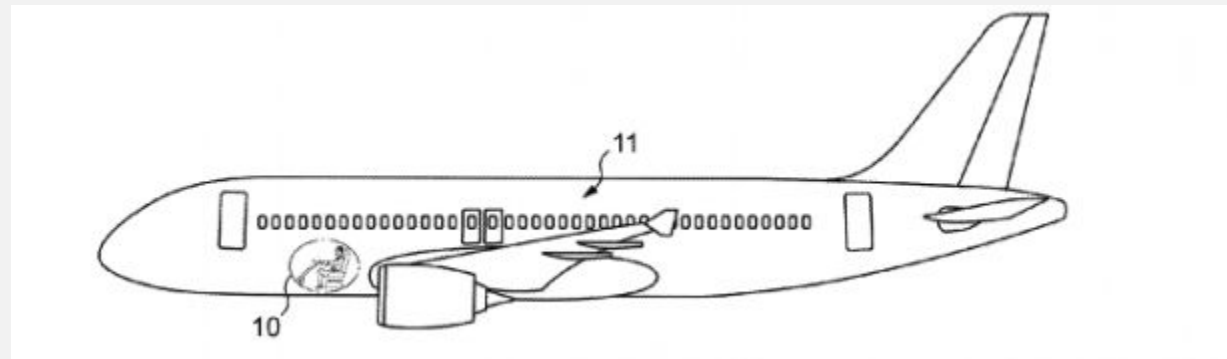
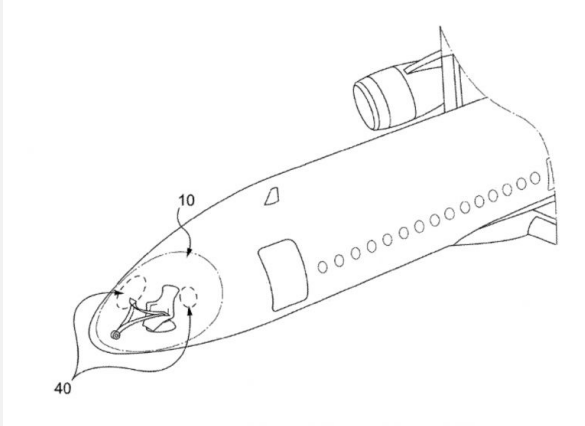
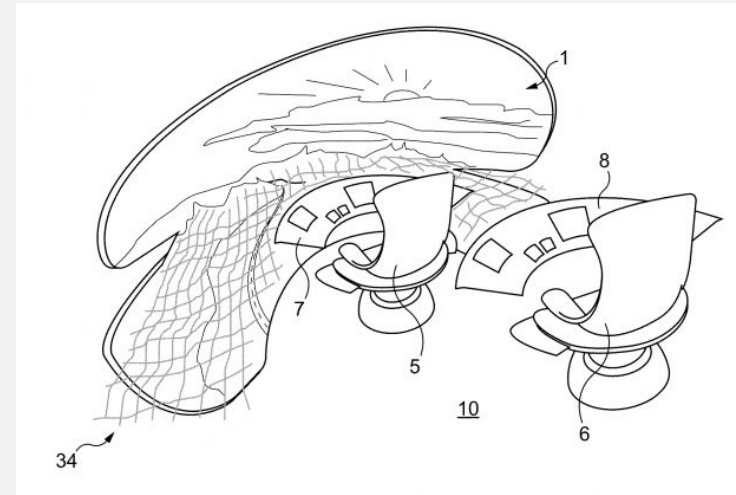
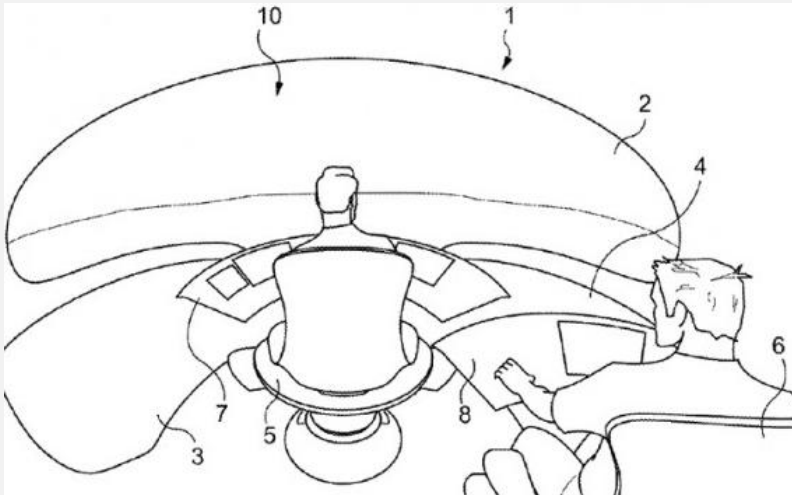
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Working Together

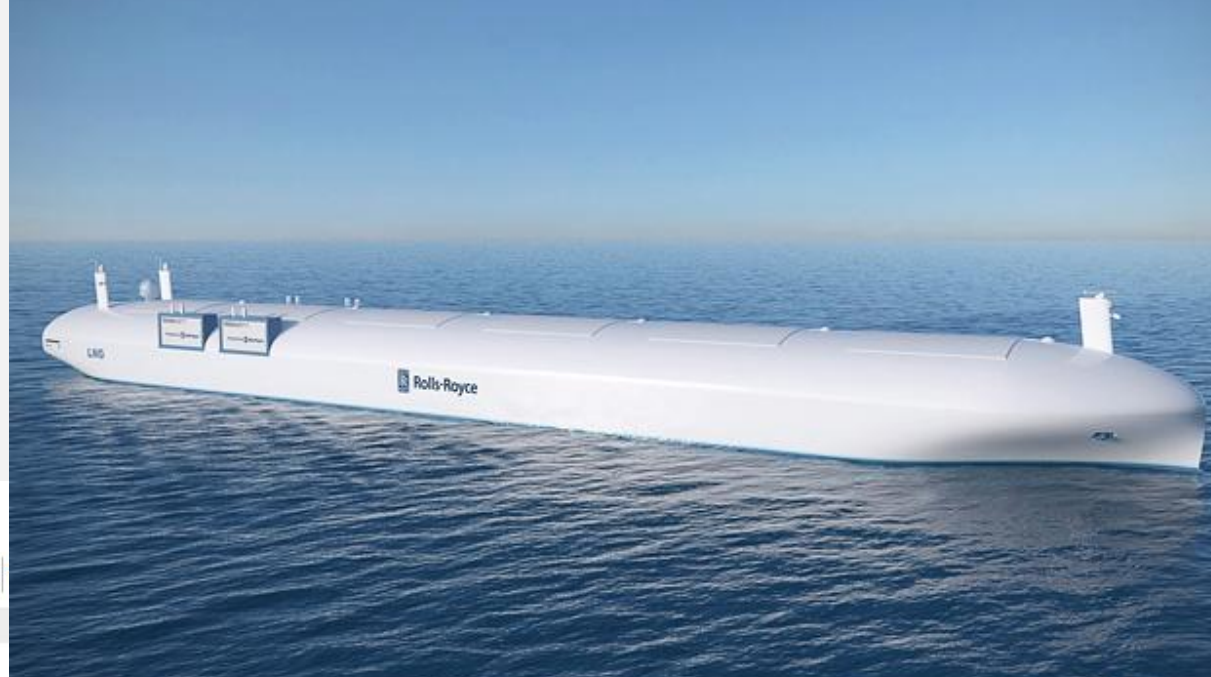
- Autonomous System
- Simulation
- Human(s)

Remote Humans

Airbus Windowless Cockpit Patent



Rolls-Royce Remote-Controlled Ships Concept



theguardian

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[Business](#) > [Rolls-Royce](#)

Rolls-Royce plans remote-controlled ships with no captain or crew on board

British engineering company claims huge cargo carriers will be cheaper, greener and safer than fully manned vessels

Rupert Neate

The Guardian, Friday 30 May 2014 20.12 BST

[Jump to comments \(74\)](#)

A fleet of giant cargo ships, up to almost a quarter of a mile long and wider than a motorway, are to crisscross the world's oceans without a captain or crew on board.

The remote-controlled vessels, which could set sail within the decade, are the latest development in the growing trend for unmanned vehicles, with drone aircraft already flying and Google planning to introduce driverless cars.

Rolls-Royce, the British engineering company developing the ships, claims the unmanned ships will be cheaper, greener and safer than those with a full complement of captain and crew.



THINKE



[Home](#) > [Photography](#) > Oculus-controlled dual-camera drones could be the...

OCULUS-CONTROLLED DUAL-CAMERA DRONES COULD BE THE FUTURE OF AERIAL VIDEOGRAPHY

By Felix Esser — April 28, 2014



How does a UAS Pilot Feel at the End of the Day?



Augmented Humans

Robots on Humans

Harvard Wyss Institute for
Biologically Inspired Engineering's
Soft Exosuit



Raytheon's Second-Generation
Exoskeleton (XOS 2)





Humans in Robots

Copyright

Google Glass



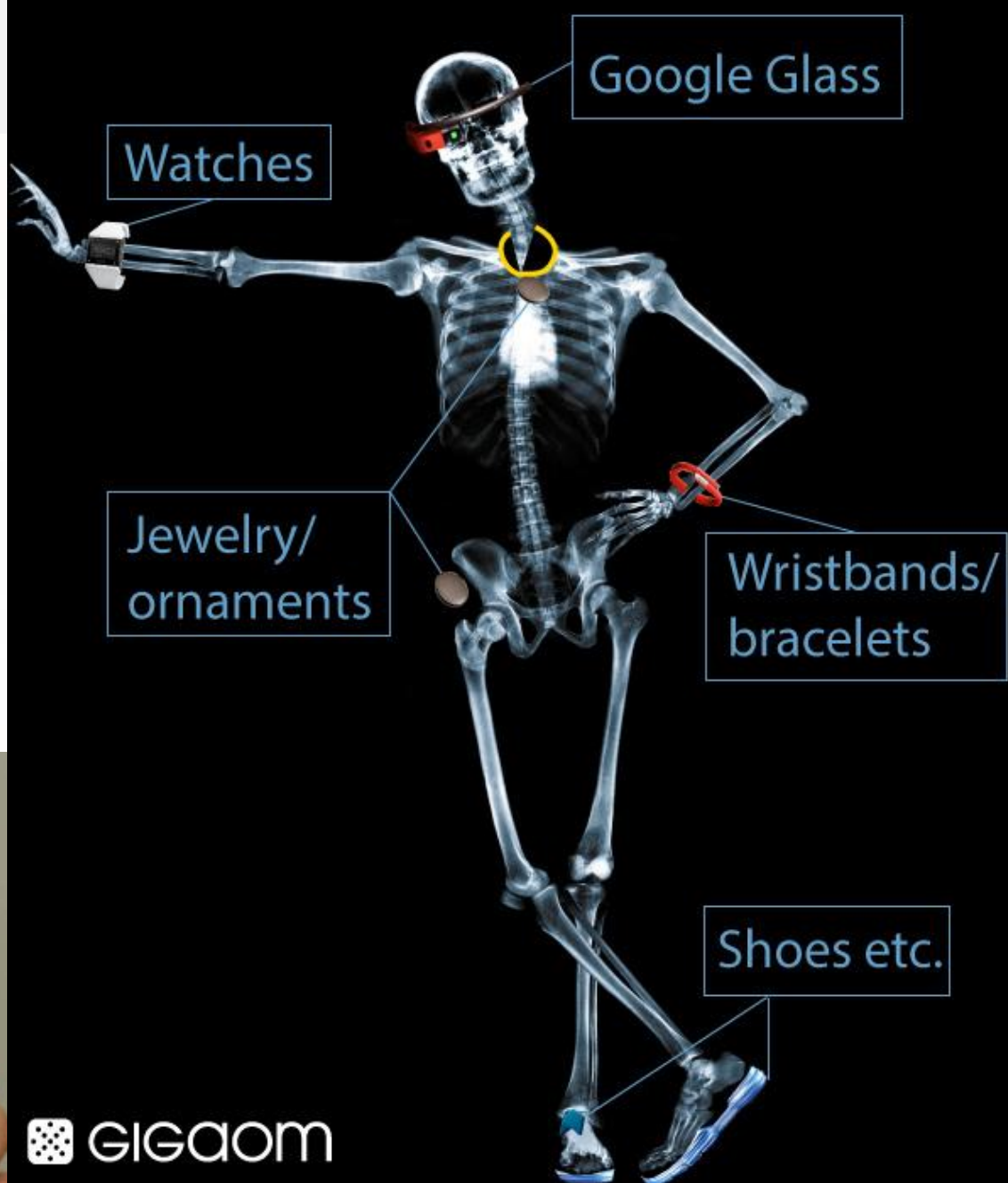
Source - Bethanie Mattek-Sands with Google Glass

THINKE

Augmented Reality in the Workplace



Human Sensors



GIGAOM

THINKE

"Mind-Controlled" Airplanes Might Just Be A Thing



Pranav Dixit

Filed to: MIND-CONTROL 6/01/14 5:58pm

9,630 🔥 2 ★ ▼



A [mind-controlled](#) iPhone? Sure, we'll take it. A [mind-controlled](#) Samsung Galaxy Note 10.1? Why not? A mind-controlled airplane powered by the pilot's brainwaves? Hold on for a moment while we look for the nearest emergency exit.

Using your mind to control an airplane sounds bonkers, but according to this [CNET report](#), researchers are working on just that. A team from the Technische Universität München (TUM) in Germany strapped electroencephalography electrodes to the heads of participants, put them in a flight simulator - not a real aircraft, thank heavens - and instructed them to control the plane using only their minds.

Even though few of the participants had any cockpit experience, the experiment was apparently a success since they were all able to fly so well that they could have gotten a pilot's licence.

Mind Control





Mind Over Mechanics



Mind and
Machine

Mind Reading

'Mind-Reading' Scientists Reconstruct Human Faces From Brain Scans

The Huffington Post | By Jacqueline Howard

Posted: 04/01/2014 8:57 am EDT | Updated: 04/01/2014 4:59 pm EDT



648



Images



Reconstructions



Yale University

Facial images shown to men and women while they were undergoing fMRI scans (above), and the reconstructed images based off of that MRI data (below).



Different Humans

Cultural Challenges of Introducing Autonomous Systems?



Docklands Light Railway
Autonomous (opened 1987)
100m Annual Passenger Journeys
“Greenfield Development”

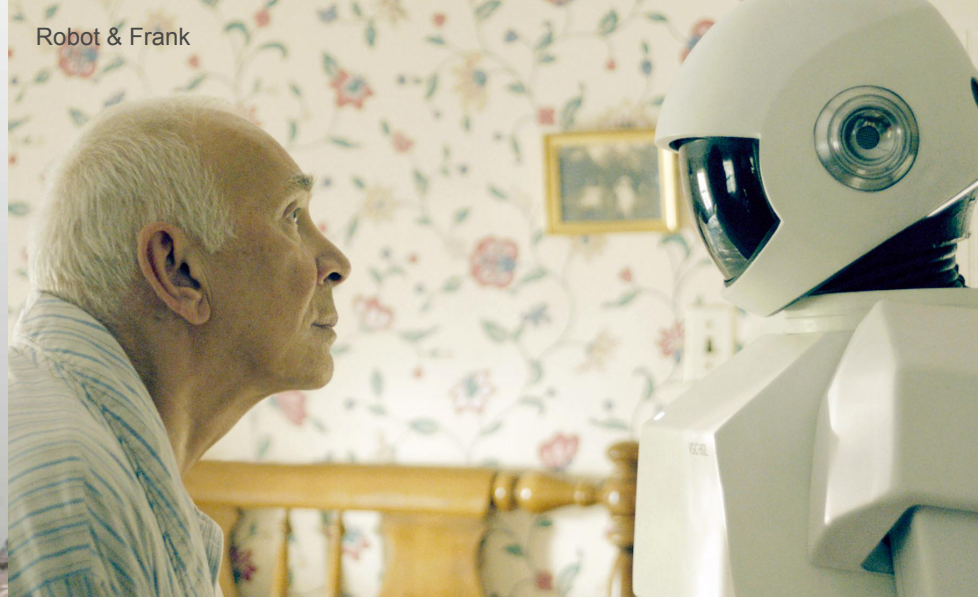
Central Line
Driver Operated (1992 Stock)
260m Annual Passenger Journeys
“Brownfield Development”



Less Humans



140FRIDAY



Robot & Frank



Dyson



Beautiful Wallpapers

Communication and Trust



- Live
- Synthetic

- Live
- Simulation

~~Synthetic~~

Sir Jock Stirrup

Chief of Defence Staff

2007 RAeS Edwin Link Lecture



- “...the crew of a submarine when it is submerged at least is in many ways already operating in a virtual environment...”
- “...we can see emerging *the fuzing of* synthetic and real world environments *such* that would be it would it make increasingly difficult to distinguish between training carried out in simulation and the real thing.”





Questions?