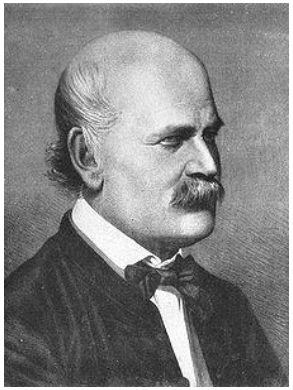
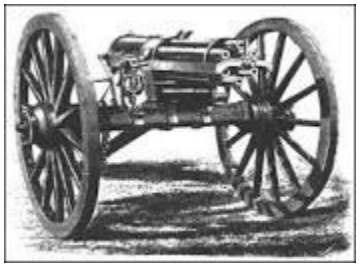


Dr. Ignaz Semmelweis



Gatling Gun

Nicolas Appert

Innovation

*Innovation: "….a **new idea**, **device**, or **method**; the act or process of introducing new ideas, devices, or methods".* Webster's Dictionary

LtGen Mike Dana, USMC
16 May 2017

"The best way to predict the future is to invent it"
by Alan Kay

Marc Bloch

This brief has thirteen slides

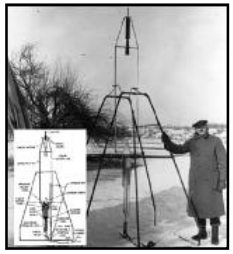
Patton & Guderian

The Speed of Innovation!

Biplane Fighter
Speed: 186 MPH

Messerschmitt Me 262
Speed: 541 MPH

Goddard Rocket
Altitude: 41 feet
Speed: 60mph



V-2
Altitude: 60 miles
Speed: 3580mph

Horse-Pulled Artillery

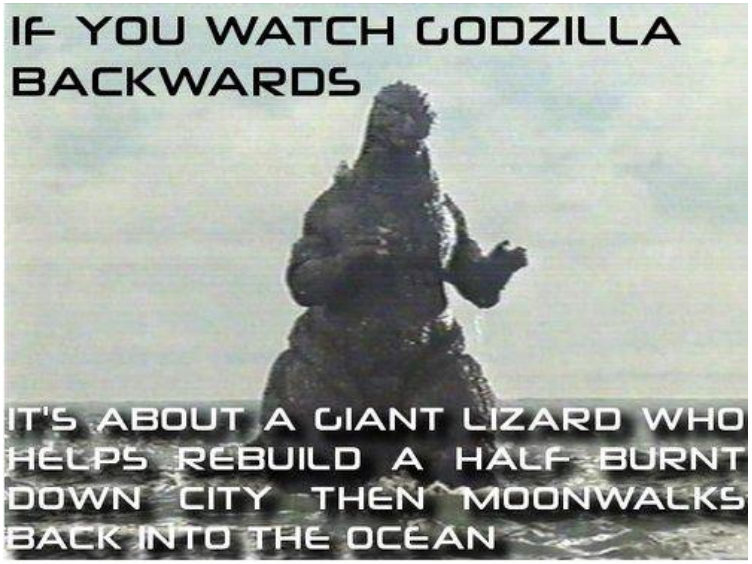
Truck-Pulled Artillery

Man-in-Balloon Spotting

Radar/Sonar

The way you look at the problem, can be the problem…..

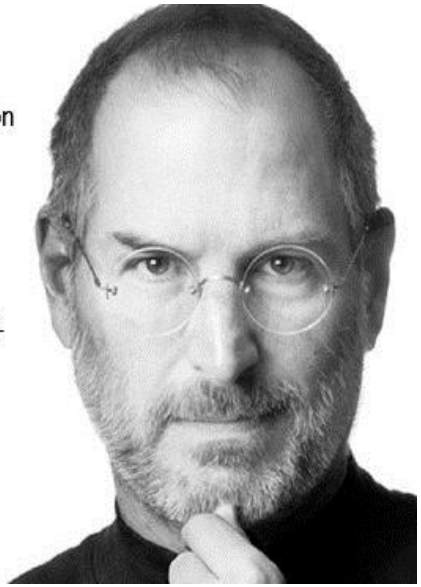
…the power of combinations and perspectives…

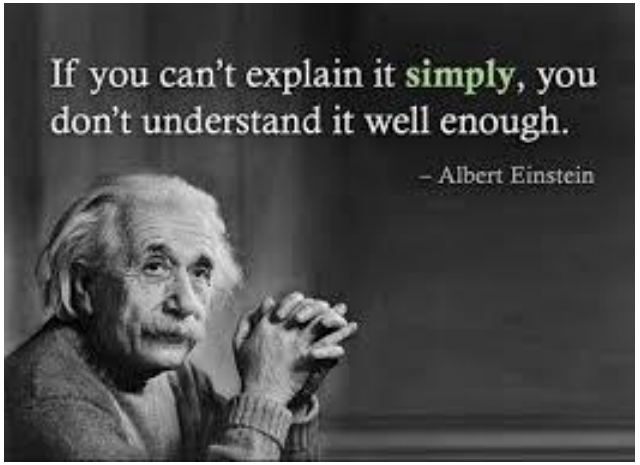


It seemed obvious to them after a while. That's because they were able to connect experiences they've had and synthesize new things. And the reason they were able to do that was that they've had more experiences or they have thought more about their experiences than other people.

Unfortunately, that's too rare a commodity. A lot of people in our industry haven't had very diverse experiences.

So they don't have enough dots to connect, and they end up with very linear solutions without a broad perspective on the problem. The broader one's understanding of the human experience, the better design we will have."





Distill complexity into actionable parts….

Then…and Now….

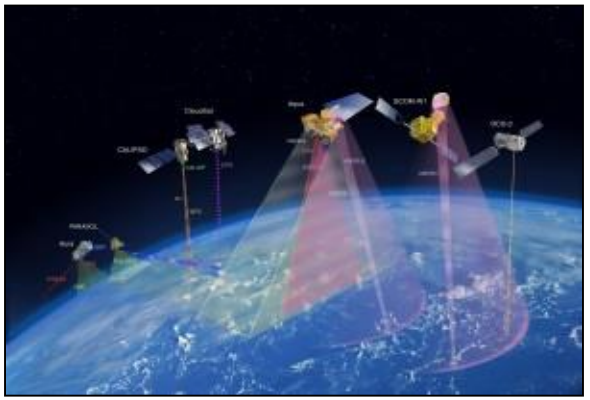
Three dimensions of warfare…….

Air

Sea

Land

Five dimensions of warfare…….



Space

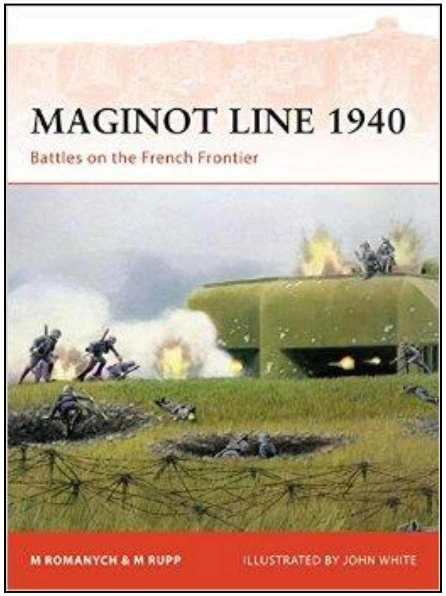
Air

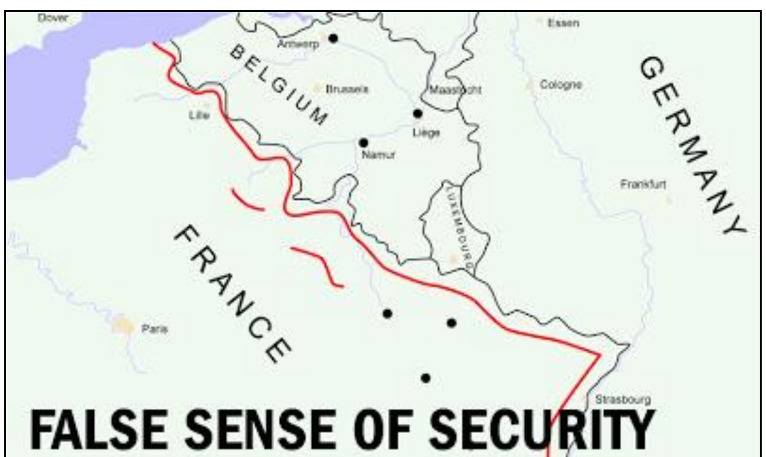
Sea/Sub-Surface

Cyber

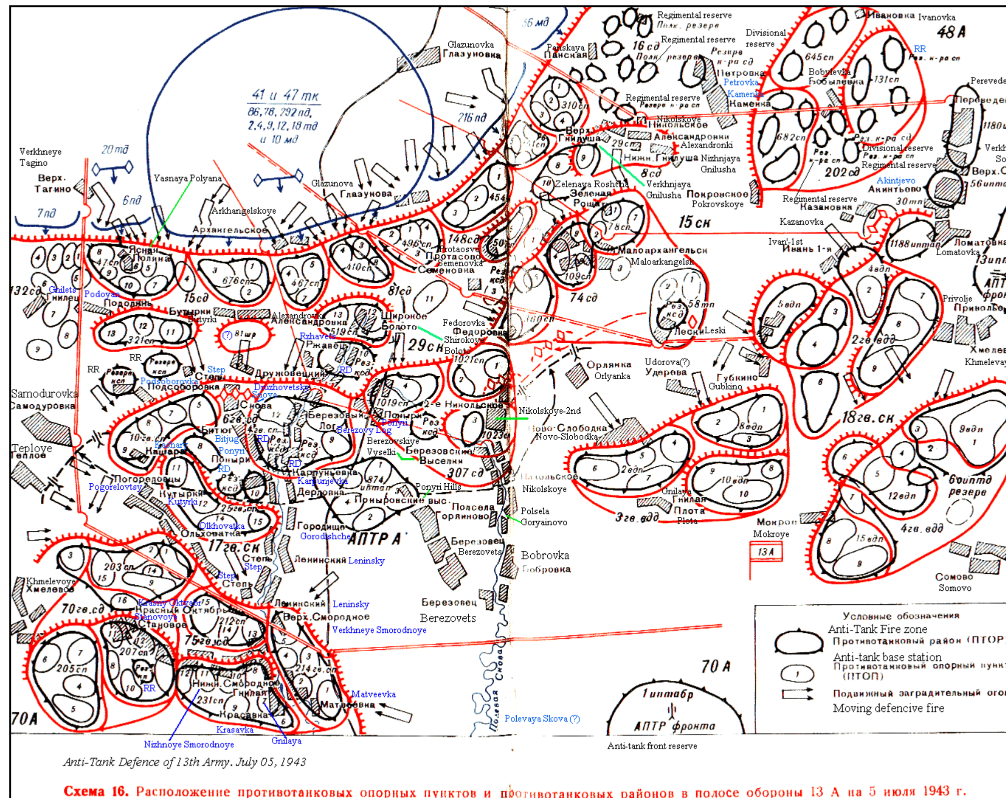
Land

Anti-Access

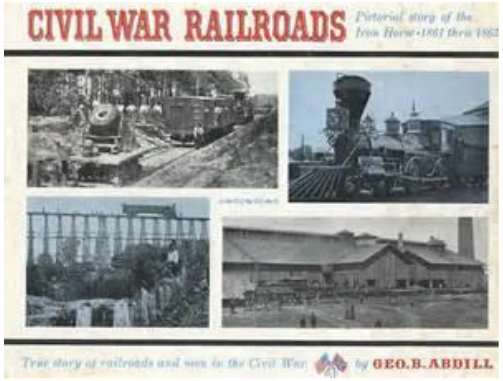

MAGINOT LINE 1940
Battles on the French Frontier
M ROMANYCH & M RUPP
ILLUSTRATED BY JOHN WHITE

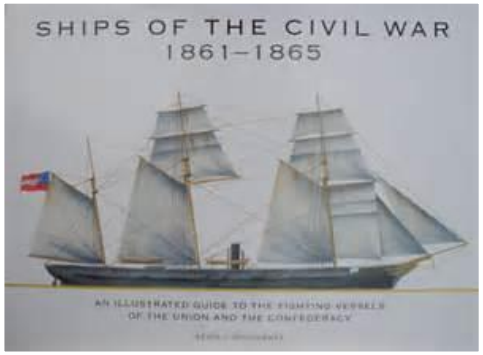

Dover
Antwerp
Essen
BELGIUM
Brussels
Maastricht
Cologne
GERMANY
Lille
Liege
Namur
Frankfurt
LUXEMBOURG
FRANCE
Paris
Strasbourg
FALSE SENSE OF SECURITY


THE BATTLE
OF KURSK


Условные обозначения
Anti-Tank Fire zone
Противотанковый район (ПТОР)
Anti-tank base station
Противотанковый опорный пункт (ПТОП)
Подвижный заградительный огонь
Moving defencive fire
70 А
13 А
48 А
Anti-tank front reserve
Anti-Tank Defence of 13th Army. July 05, 1943
Схема 16. Расположение противотанковых опорных пунктов и противотанковых районов в полосе обороны 13 А на 5 июля 1943 г.

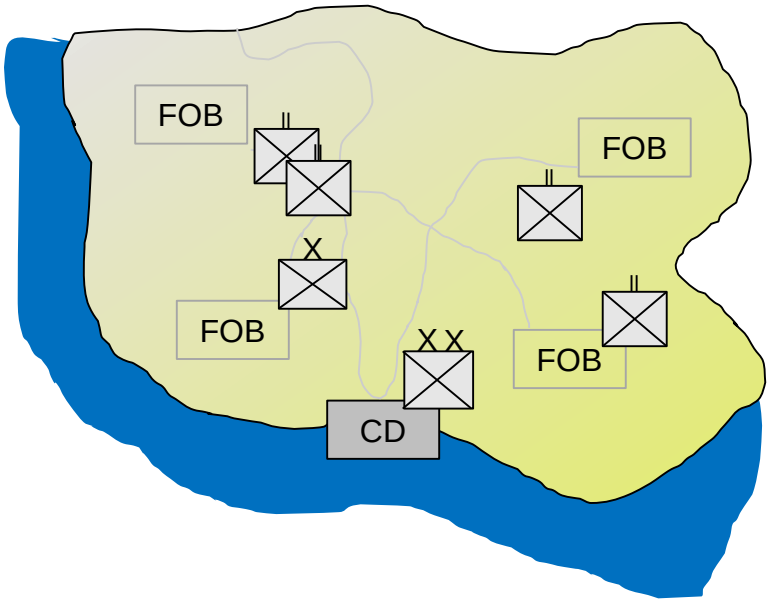
American Way of War (19th & 20th Century)





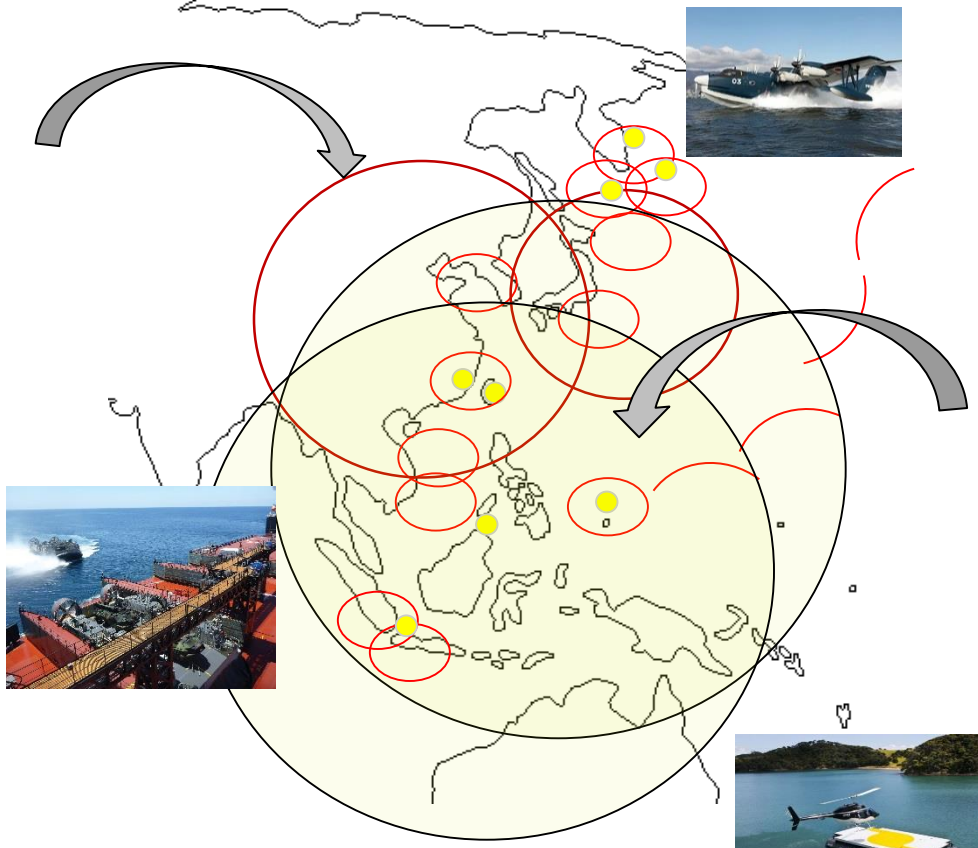
Then…and Now…

OIF / OEF



- **Air / Sea Dominance**
- **Secure Air & Surface LOC's**
- **Assured C4I**
- **Static AOR**

Future Threat



- **Contested Air / Sea / Space**
- **Intermittent Air / Sea LOC's**
- **Degraded C4I**
- **Fluid – Dynamic AOR (s)**

Mobility Continuum…Past, Present, Future

Humans

Roman Legion

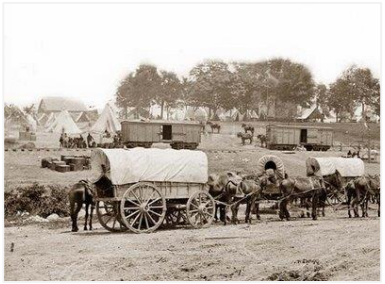
Napoleon

WWI / WWII

Today

Humans on Platforms

Genghis Kahn



Civil War

WWI / WWII

Today

Unmanned Platforms Supporting Humans

More Advanced, More Costly, More Weight

Marine Corps Infantry Combat Equipment

Main 2015 Cost Drivers (No 2000 Equivalent)

Radio Set	$3,872
SAPI	$2,205
IR Laser	$1,331
Rifle Optics	$ 865
	$8,273

- In 1980 the "per-Marine planning factor" for strategic airlift was 295 pounds.
- In 2010 that number was 400 pounds.

Weight: 23K lbs
Range: 265 nm
Cost: $26M

CH-46

Fuel consumption: 380 gal
Lift: 14 troops; 4K lbs cargo

Weight: 33K lbs
Range: 428 nm
Cost: $67M

MV-22

Fuel consumption: 2040 gal
Lift: 24 troops; 20K lbs cargo

Weight: 3950 lbs
Cost: $1K

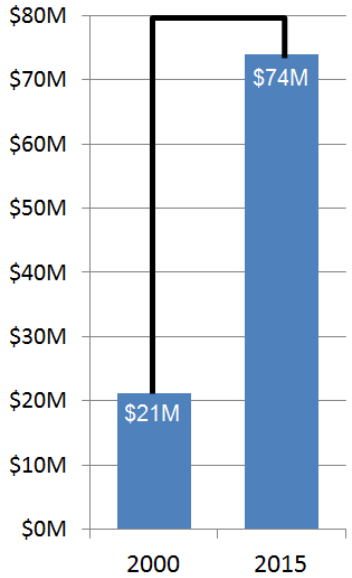
M151 Jeep

Fuel consumption: 17.3 MPG
Production Rate: 1 per 1.5 minutes

JLTV

Weight: 18k
Fuel consumption: 5.6 MPG
Cost: $400K

Marine Corps Infantry Bn 2000 vs. 2015

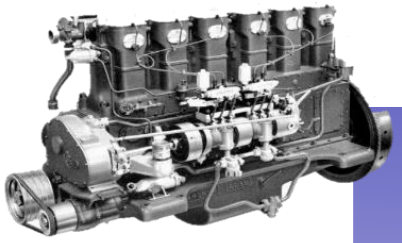


- USMC infantry battalion in 2001 = 3,205 PEIs.
- USMC infantry battalion in 2012 = 8,400+ PEIs.

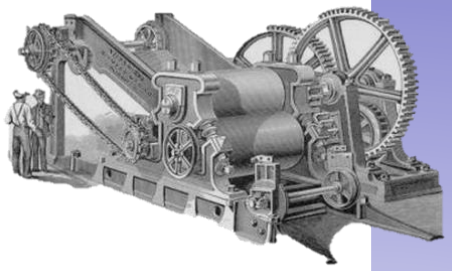
Major Plus-Ups

RADIO SET
COMBAT OPS CENTER
COMD AND CNTRL
SAPI
TRUCK,UTILITY
ARMOR SET
LAUNCH UNIT
NIGHT VISION DEVICES

Vannevar Bush

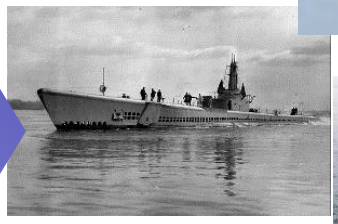


Combustion

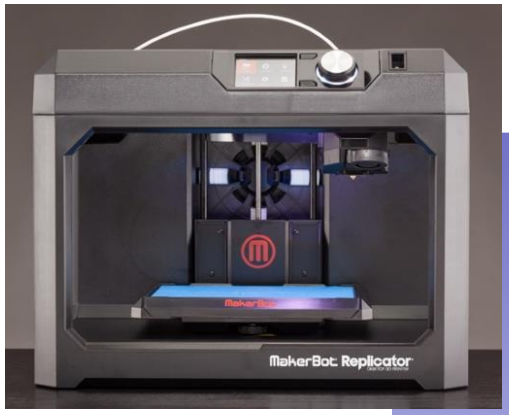


Interoperable Parts

Mass Production



Today's…Vannevar Bush



Additive Manufacturing

Unmanned Platforms

Smart Logistics

Internet of Things

Hybrid Logistics Concept of Operations

Unmanned Logistics Systems (ULS): For Transportation, Medical, and Maneuver

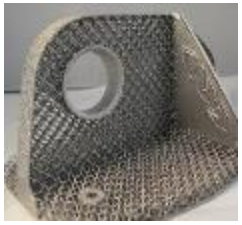
cargo drones | self-driving vehicles | quadrupeds | robotics | autonomy




Additive Manufacturing (AM/3D Printing): For Maintenance, Supply, Engineering, Medical

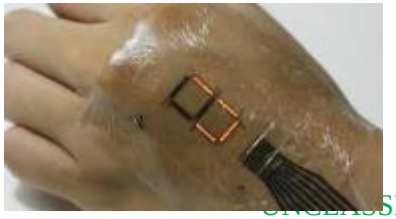
desktop 3d printing | supply chain AM for legacy parts | AM-unique platforms & materials



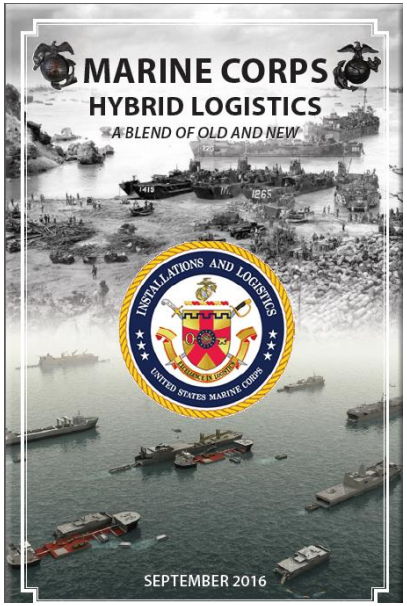




Smart Logistics (SmartLog): For Supply, Transportation, Maintenance, Engineering, Medical, …

internet of things | ubiquitous sensors | advanced analytics | machine learning | big data
blockchain security | mobile computing | lightweight apps | virtual/augmented reality

Questions?


MARINE CORPS
HYBRID LOGISTICS
A BLEND OF OLD AND NEW
INSTALLATIONS AND LOGISTICS
UNITED STATES MARINE CORPS
SEPTEMBER 2016