

THE SCIENTIFIC ADVISOR
U.S. ARMY TRAINING AND DOCTRINE COMMAND

For your information from Dr. Berenson.

U.S. AIR FORCE 2025 STUDY

GLIMMERINGS OF THE FUTURE

Dr. Paul J. Berenson
(804) 727-3869
Scientific Advisor to the CG
U.S. Army Training and Doctrine Command

AIR WAR COLLEGE
MAXWELL AIR FORCE BASE

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E-Mail: berenson@monroe.emh1.army.mil



DISCLAIMER

**Not Necessarily Official Army Views
Current (Developing) Personal Views and Advice
“I Love a New Idea”**

TRADOC: Where Tomorrow's Victories Begin



LONG RANGE PLANNING PHILOSOPHY

- **DEFINING PROBLEM PROPERLY IS HALF THE JOB OF OBTAINING A SOLUTION**
- **SCENARIOS ARE NOT PREDICTIONS OF FUTURE. SCENARIOS ARE PLANNING TOOLS TO ENSURE READINESS TO DEAL WITH WHATEVER THE FUTURE MAY BRING (THE ART OF THE LONG VIEW, SCHWARTZ)**
- **WE DON'T KNOW WHAT WE DON'T KNOW**
- **GET IT ROUGHLY RIGHT, RATHER THAN PRECISELY WRONG**

THE WORLD AS IT IS, NOT AS WE WOULD LIKE IT TO BE

**IT IS DIFFICULT TO PROPHESEE,
ESPECIALLY ABOUT THE FUTURE**

CHINESE PROVERB

TRADOC: Where Tomorrow's Victories Begin

**WILBUR WRIGHT HAS MADE THE STATEMENT
THAT, IN HIS OPINION, THE USE OF THE
AEROPLANE FOR DROPPING BOMBS OR
EXPLOSIVES INTO A HOSTILE ARMY IS
IMPRACTICABLE, AS THE MACHINES MUST RISE
1000 OR 1500 FT. ABOVE THE GROUND
TO ESCAPE SHELL FIRE.**

**AT THAT HEIGHT ACCURACY WOULD BE
IMPOSSIBLE IN DROPPING EXPLOSIVES WHEN
MOVING 40 TO 50 MILES AN HOUR.
HE BELIEVES THEIR ONLY USE IN WAR WILL BE
AS SCOUTS AND MESSENGERS.**

- POPULAR MECHANICS, JULY 1909

A REALISTIC VIEW OF HISTORICAL “CONSTANTS” **(6000 YEARS)**

- **SIZE OF EARTH AND 24-HOUR DAY**
- **AVERAGE EARTH TEMPERATURE, AND SIZE AND SHAPE OF LAND AREAS**
- **BIRTH, DEATH AND HUMAN PHYSIOLOGY**
- **HUMAN NATURE (“MAN’S INHUMANITY TO MAN”)**
 - **VIOLENCE IS IN OUR GENES**
 - **HUMANS MOTIVATED BY POWER, SECURITY, FEAR, GREED, AND RESPECT**
 - **PEOPLE KILLING PEOPLE FOR ANY DIFFERENCE (WE-THEY SYNDROME)**
- **WARS AND OTHER CONFLICTS: THEY ARE STARTED BY INDIVIDUAL LEADERS**
- **PEOPLE (TRAINING AND LEADERSHIP) ARE KEY TO WINNING AND LOSING BATTLES**
- **ARMIES NEED FOOD, TRANSPORTATION, COMMUNICATIONS, WEAPONS AND LEADERS**
- **HUMAN OPTIMISM (PREACH LOVE AND CHARITY)**

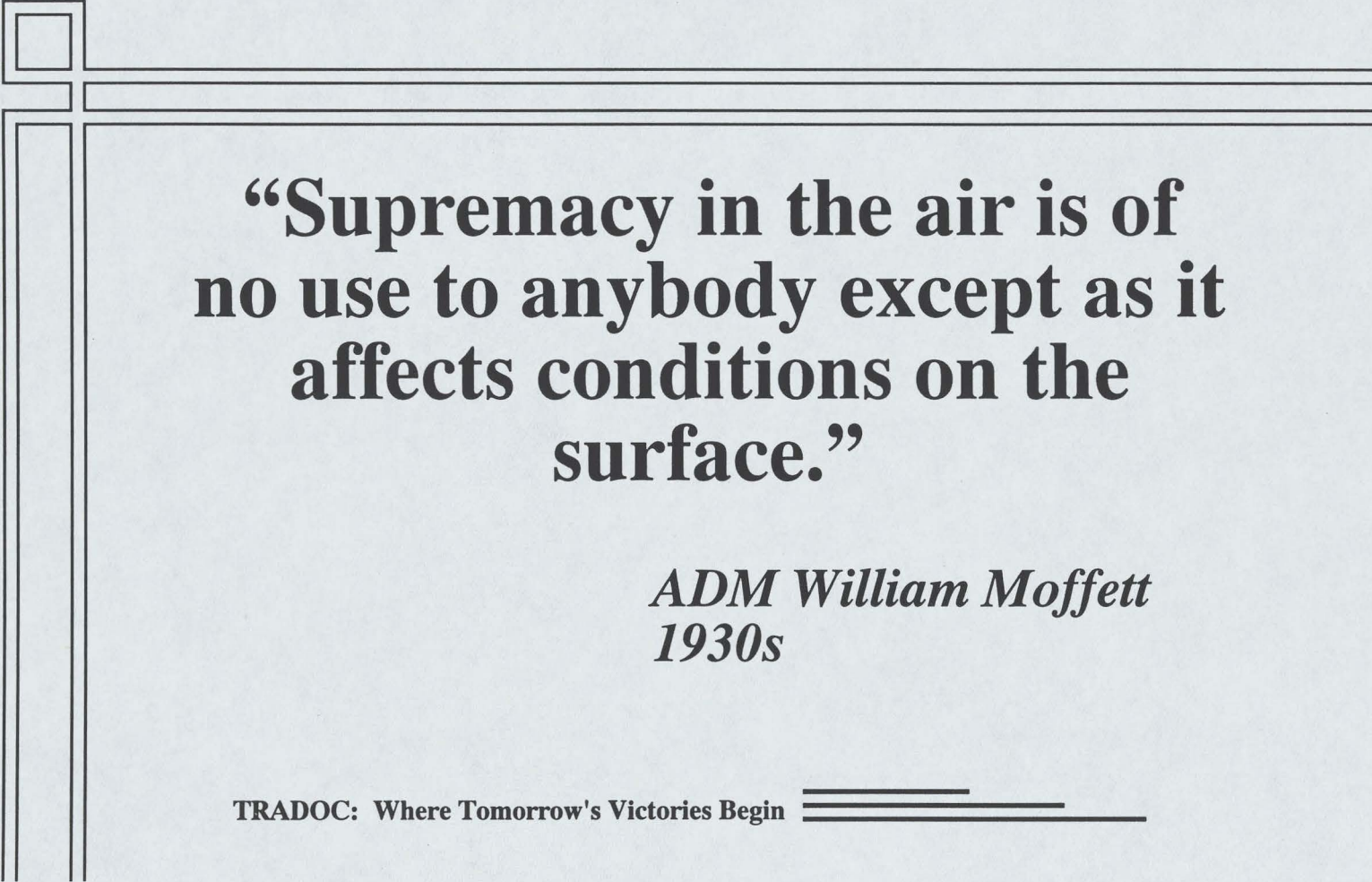
HAGAR



CURTIS

CHANGING ENVIRONMENT FOR MILITARY OPERATIONS

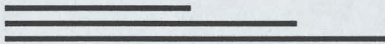
- INCREASING VARIETY OF MILITARY OPERATIONS (E.G., BOSNIA, HAITI)
- NON-NATIONAL ADVERSARIES (E.G., DRUG CARTELS)
 - FEW MORAL OR LEGAL CONSTRAINTS
- NON-MILITARY ADVERSARIES (E.G., NOT IN UNIFORM)
- INFORMATION AGE (E.G., INFO WAR, NETWORKS, MEDIA)
- MILITARY OPERATIONS IN BUILT-UP AREAS
- BIOLOGICAL WARFARE (MUST DETECT AND PROTECT)
- OVERSEAS BASES DECREASING
- SANCTUARY AIR BASES UNLIKELY
- LESS U.S. TOLERANCE OF CASUALTIES
- NICHE WARFARE (TECHNOLOGY PROLIFERATION)



**“Supremacy in the air is of
no use to anybody except as it
affects conditions on the
surface.”**

***ADM William Moffett
1930s***

TRADOC: Where Tomorrow's Victories Begin



AIR FORCES INVOLVEMENT VS.
LAND FORCES COMMITMENT

-- EASIER POLITICALLY FOR PRESIDENT TO USE AIR FORCES (AF AND NAVY) THAN LAND FORCES (E.G., BOSNIA)

CONGRESS WANTS TO VOTE ON USE OF LAND FORCES

-- USE OF AIR FORCES INVOLVES, BUT DOES NOT COMMIT THE U.S.

-- PUTTING LAND FORCES ON THE GROUND COMMITS THE U.S.

-- DIFFERENCE A MATTER OF LIFE AND DEATH; IN HAM AND EGGS, THE CHICKEN IS INVOLVED, THE PIG IS COMMITTED

- AF SHOULD SEARCH FOR CONCEPTS AND TECHNOLOGY THAT MAY PROVIDE VICTORY FROM USE OF AIR POWER ALONE

AIR SUPERIORITY ASSUMED

- **HAVE HAD FOR 50 YEARS**
- **MUST NOT TAKE FOR GRANTED (BUT WE TEND TO)**
- **ESSENTIAL FOR FUTURE (FORCE XXI) ARMY OPERATIONS**
 - FORCE PROJECTION**
 - DISPERSED (NON-LINEAR) OPERATIONS**
 - DOMINANT BATTLEFIELD AWARENESS (DBA)**
 - TACTICAL LOGISTICS**
- **UAV'S AND CRUISE MISSILES VERY IMPORTANT**
- **AIR SUPERIORITY IS ARMY TOP PRIORITY AIR FORCE MISSION**

INCREASING JOINTNESS REQUIRED

“BECOME A FAN OF EACH OTHERS SERVICES” GEN HARTZOG

- **BATTLE SPACE EXPANDING: JOINT WARFIGHTING AT LOWER ECHELONS**
- **ADAPTIVE JOINT FORCE PACKAGES**
- **INFORMATION WARFARE IS JOINT CDRS BUSINESS (JOINT INFORMATION CORPS)**
- **ONE GLOBAL COMMUNICATIONS SYSTEM (“THE NETWORK IS THE COMPUTER”)**
- **NEED ONE INTEGRATED, INTEROPERABLE, REAL TIME JOINT C3/I SYSTEM TO COMBINE ALL SERVICES CAPABILITIES, E.G., THEATER AIR (MISSILE) DEFENSE (“C4/I FOR THE WARRIOR”)**
- **MODERN INFORMATION TECHNOLOGY ELIMINATES NEED FOR DIVIDING BATTLESPACE BETWEEN SERVICES, E.G., FSCL**
- **SERVICES NEED COMMON LANGUAGE -- SYMBOLOGY IN ORDER TO EXCHANGE INFORMATION**

THINK ABOUT WARFARE FROM CINC/JTF COMMANDER PERSPECTIVE

TRAIN (JOINTLY) AS WE WILL FIGHT (JOINTLY)

JOINT DOCTRINE

JOINT COMMUNICATIONS

JOINT SIMULATIONS

JOINT TRAINING

JOINT EXERCISES

JOINT WAR COLLEGES

JOINT ATTITUDE (VERSATILITY, ADAPTABILITY)

JOINT PLANNING

THE KEYS TO JOINTNESS:

-- AUTOMATED JOINT TELECOMMUNICATIONS INTEROPERABILITY

**-- JOINT MENTAL ATTITUDE AND AGILITY OF SERVICES AND
WARFIGHTING COMMANDERS (LEADERSHIP)**

LAND FORCE SPACE SYSTEM REQUIREMENTS

- PAST SPACE SYSTEM REQUIREMENTS WERE DRIVEN BY NATIONAL AND STRATEGIC REQUIREMENTS, FOCUSED ON THE SOVIET UNION.
- OPERATIONAL AND TACTICAL SUPPORT OF THE THEATER COMMANDER IS NOW AT LEAST AS IMPORTANT.
- THE ARMY'S USE OF SATELLITE RECONNAISSANCE, TARGETING, COMMUNICATIONS, NAVIGATION, AND TOPOGRAPHY IS EQUALLY IMPORTANT TO THAT OF THE NAVY AND THE AIR FORCE. (SPACE IS PRINCIPALLY A COMBAT SUPPORT AREA.)
- THE ARMY HAS NOT HAD ADEQUATE INFLUENCE ON PAST SPACE SYSTEM REQUIREMENTS BECAUSE IT DID NOT BRING COMPARABLE FUNDS AND RANK TO THE JOINT SPACE SYSTEM DECISION ARENA.
- THE ARMY NEEDS TO HAVE THE INFLUENCE MERITED BY THE IMPORTANCE OF SPACE SYSTEMS TO THE LAND FORCE CONTRIBUTION TO JOINT WARFIGHTING AND OOTW.
- THE ARMY SHOULD DETERMINE SPACE REQUIREMENTS FOR LAND FORCES (INCLUDING USMC), AND OBTAIN THE SUPPORT OF THE USMC, USN AND THE CINCS FOR MEETING CINC LAND FORCE SPACE SUPPORT REQUIREMENTS, REGARDLESS OF WHO PROVIDES FUNDING.

BATTLE COMMAND

IS THE

MOST IMPORTANT COMBAT FUNCTION

(MAY NOT BE TRUE FOR AIR POWER)

THE REVOLUTION IN MILITARY AFFAIRS IS
PRINCIPALLY A REVOLUTION IN BATTLE COMMAND

- COMMANDERS AT ALL ECHELONS CAN HAVE NEAR-REAL-TIME COMMON PICTURE OF THE BATTLE SPACE (INTERNETTED INFORMATION)
- CAN KNOW TERRAIN, WEATHER, LOCATION AND STATUS OF FRIENDLY UNITS
- CAN KNOW LOCATION OF SIGNIFICANT ENEMY UNITS
- CAN RAPIDLY COMMUNICATE WORLD-WIDE (OPERATIONS AND ORGANIZATIONS NOT CONSTRAINED BY COMMUNICATIONS)
- CAN COMMAND ON THE MOVE
- CAN "PULL" DESIRED INFORMATION

RESULT: INCREASED TEMPO, LETHALITY AND SURVIVABILITY

A REVOLUTION IN COMMAND

INFORMATION IS THE
CURRENCY OF COMMAND

WASHINGTON

OBSERVE: TELESCOPE
ORIENT: WEEKS
DECIDE: MONTHS
ACT: A SEASON

YORKTOWN
1781

GRANT

OBSERVE: TELEGRAPH
ORIENT: DAYS
DECIDE: WEEKS
ACT: A MONTH

VICKSBURG
1863

PATTON

OBSERVE: RADIO/WIRE
ORIENT: HOURS
DECIDE: DAYS
ACT: A WEEK

BASTOGNE
1944

SCHWARZKOPF

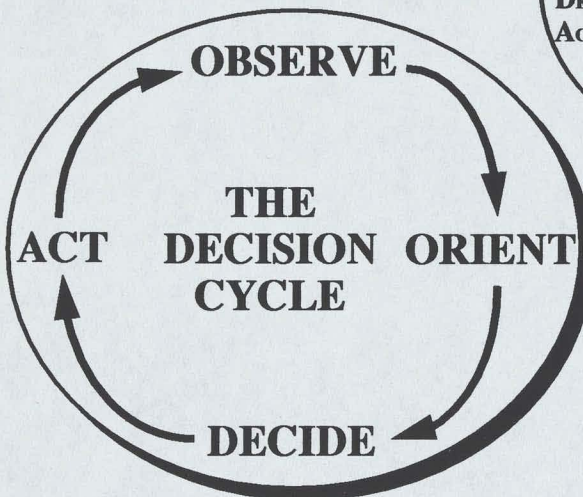
OBSERVE: NEAR-REAL
TIME
ORIENT: MINUTES
DECIDE: HOURS
ACT: A DAY

KUWAIT/IRAQ
1991

TOMORROW

OBSERVE: REAL TIME
ORIENT: CONTINUOUS
DECIDE: IMMEDIATE
ACT: < AN HOUR

FUTURE
CONFLICT
2010



**“WHILE UP-TO-DATE TECHNICAL MEANS OF COMMUNICATION
AND DATA PROCESSING ARE ABSOLUTELY VITAL TO THE
CONDUCT OF MODERN WAR IN ALL ITS FORMS, THEY WILL
NOT IN THEMSELVES SUFFICE FOR THE CREATION OF A
FUNCTIONING COMMAND SYSTEM, AND THEY MAY, IF
UNDERSTANDING AND PROPER USAGE ARE NOT ACHIEVED,
CONSTITUTE PART OF THE DISEASE THEY ARE SUPPOSED TO
CURE.”**

MARTIN VAN CREVELD
COMMAND IN WAR

INFORMATION WARFARE

- Likely to be more important than generally perceived
- Key to winning quickly with minimum casualties
- Revolutionary Warfare: eg, Mission Kill - Economic
- Inherently joint, and all services aggressively pursuing
- Bigger than DoD
- Info War protect needs highest priority
 - - U.S most vulnerable nation/military
 - - Possible exploitation of U.S. vulnerabilities terrifying

TRADOC: Where Tomorrow's Victories Begin

INFO WARFARE IS MORE THAN C2W

- **SPECTRUM OF INFO WAR: ALWAYS OCCURRING**
- **INFO WAR IS WORLDWIDE (GLOBAL INFO ENVIRONMENT)**
- **INTERAGENCY AND COMBINED**
- **PRECONFLICT INFO WAR MAY PREVENT WAR**
- **MILITARY CAN'T CONTROL ALL INFO WARFARE**
- **INFLUENCE MEDIA (PUBLIC AFFAIRS INCREASINGLY IMPORTANT)**
- **STRATEGIC PSYOPS (TV) (SPECIAL FORCES)**
- **ATTACK WEAPON IMBEDDED AUTOMATED CONTROL SYSTEMS**
 - COULD BECOME A COMBAT ARM**

COMPUTER INFORMATION NETWORK SECURITY

- **IT IS IMPOSSIBLE TO PROVIDE PERFECT NETWORK SECURITY.**
- **MOST VIOLATIONS OF COMPUTER NETWORK SECURITY WILL NOT BE DETECTED (WON'T KNOW WE ARE UNDER ATTACK).**
- **IT IS VERY DIFFICULT TO IDENTIFY WHO IS ATTACKING THE NETWORK EVEN WHEN IT IS KNOWN THAT THE NETWORK IS UNDER ATTACK (WON'T KNOW WHO IS ADVERSARY).**
- **U.S. TENDS TO BE MOST VULNERABLE BECAUSE OF INCREASING DEPENDENCE ON INFORMATION NETWORKS.**

INFO WAR PROTECT SUMMARY

- **DOWNSIDE OF INFO WAR AS GREAT AS UPSIDE.**
- **ALL COMPUTERIZED INFO NETWORKS VULNERABLE**
- **U.S. MOST COMPUTERIZED AND THEREFORE MOST VULNERABLE**
- **INFO WAR CAN BE EFFECTIVE WITH A SMALL, EXPERT FORCE OF INFO “HACKERS.”**
- **WHAT IS THE MANUAL BACKUP? HOW WILL U.S. FORCES OPERATE WHEN COMPUTER ISN'T WORKING**
- **HOW WILL U.S. KNOW IT IS UNDER INFO WAR ATTACK AND WHO IS THE ATTACKER?**
- **MUST BE CAREFUL THAT PROTECTION DOES NOT CAUSE PARALYSIS**
- **INFO WAR PROTECT (E.G., COMPUTER INFORMATION NETWORK PROTECTION) MUST BE A PRINCIPAL MILITARY SYSTEM DESIGN REQUIREMENT**

INFORMATION WARFARE MAJOR CONCERNS

- IW BIGGER THAN DOD
- NATION WILL TURN TO MILITARY IN ANY CRISIS
- IW ROLES & MISSION: WHO IS IN CHARGE?
- POLICY, LEGAL AND ROE CONSTRAINTS
- HOW DO WE KNOW WHO IS THE ATTACKER? (NON-NATIONAL ATTACKERS CAN PLAY THIS GAME)
- HOW DO WE WORK WITH THE MEDIA?
- BATTLE DAMAGE ASSESSMENT (A CHRONIC WEAKNESS)
- SIMULATION OF INFO WARFARE (MODELS AND SIMULATIONS OF C3I NEED MAJOR IMPROVEMENTS)
- TRAINING FOR INFO WAR

PILOT SELECTION AND TRAINING

- **PEOPLE WIN BATTLES, NOT TECHNOLOGY**
- **5% OF COMBAT PILOTS GOT 50% OF AIR-TO-AIR KILLS IN PAST**
- **THE MAJOR ENDURING U.S. WARFIGHTING EDGE IS TRAINING**
 - **SOVIET UNION (WARSAW PACT)**
 - **IRAQ (MIG-29 COMPARABLE TO F-15, BUT THEY RAN!)**
- **TOUGH, REALISTIC TRAINING BOTH TRAINS AND SELECTS THE BEST PEOPLE (WARRIORS)**

“THE MORE SWEAT IN TRAINING THE LESS BLOOD IN COMBAT”
- **PROVIDE A CLEAR OBJECTIVE ANSWER TO THE QUESTION, “WHY WILL PILOTED AIRCRAFT BE NEEDED IN THE FUTURE?”**

TECHNOLOGY CAN REDUCE COST

- **COMMERCIAL EXAMPLES OVER LAST 40 YEARS (DUAL USE)**
 - **LONG DISTANCE TELEPHONE CALLS (FASTER, CLEARER, CHEAPER)**
 - **HAND HELD "ADDING" MACHINES (FASTER, SMALLER, CHEAPER)**
 - **COMMERCIAL AIR TRAVEL (FASTER, SAFER, SAME COST)**
 - **25" COLOR TV (BETTER QUALITY AND RELIABILITY, SAME COST)**
- **MOST MILITARY BELIEVE TECHNOLOGY INCREASES COST**
 - **EXPERIENCE IS SUCCEEDING GENERATIONS OF EQUIPMENT COST MORE**
- **MILITARY EQUIPMENT UNIT COST INCREASES BECAUSE OPERATIONAL REQUIREMENTS DEMAND TECHNICAL PERFORMANCE THAT COSTS MORE**
- **TECHNOLOGY CAN BE USED TO REDUCE COST AS WELL AS INCREASE PERFORMANCE - MUST OPTIMIZE TRADE-OFF -- F-16 LOWER COST THAN F-15**

ADDITIONAL THOUGHTS

- **KNOWLEDGE BASED WARFARE (DBA) (SEE POINT PAPER)**
- **DIFFERENT AF AND ARMY PERSPECTIVE ON BATTLE COMMAND (RESPONSIVENESS DURING COMBAT) (OODA LOOP)**
- **BATTLE SPACE VS. CLOSE, DEEP AND REAR**
- **MOBILE TARGETS**
 - **LOCATE AND IDENTIFY IS PRINCIPAL DEFICIENCY**
 - **TAGS; E.G., TBM TELS (SPECIAL FORCES)**
- **FRATRICIDE (IMPROVED JOINT TRAINING AND EXERCISES NEEDED)**
- **STEALTH - TOO COSTLY FOR ENTIRE FORCE**
- **DIRECT MIND CONTROL (WILLPOWER IS IN THE MIND)**
- **MORE IMPORTANT ROLE FOR AF IN NON-LITTORAL SCENARIOS**
- **AF ORGANIZATIONAL AGILITY**
- **AF NEEDS TO UNDERSTAND GROUND WARFARE (AND VICE-VERSA)**

**THE ONLY THING HARDER THAN GETTING A NEW
IDEA INTO A MILITARY MIND, IS GETTING AN
OLD IDEA OUT**

B. H. LIDDELL HART