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# Historical Musings on Cost/Benefit Analysis of Military Training

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# IDA | Themes: Drawing on 40 Years in the Field

- Training improves performance – both readiness and operational effectiveness
- Advanced training technology improves performance
- Training expenditures are cost-effective
- Important training innovations have been adopted
- Sometimes progress seems slow
- What can we do about it?
- An innovative approach to resource allocation
- Broadening our horizons

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# Early Analyses of the Impact of Training on Ship Readiness

- Readiness measure: the percent of time substantially mission ready
- Personnel included in analysis: those in appropriate maintenance occupations
- Measure of training: usually personnel experience; if you've been around longer, you've had more operational training
- Analyses: both individual occupations across ships (1972-1974) and quarterly time-series of the fleet (1977-1980)
- Finding: ships with more senior personnel are more ready – a consistent, very significant result

# Early Analyses of the Impact of Training on Aircraft Readiness

- Readiness measures: sortie rates aboard aircraft carriers
- Personnel included in analysis: enlisted personnel
- Measures of training: years of experience and three pay-grade categories
- Analyses: 292 squadron-quarters of operation between 1977 and 1980
- Finding: squadrons with more senior personnel are more ready – a consistent, very significant result; also additional junior personnel reduce readiness

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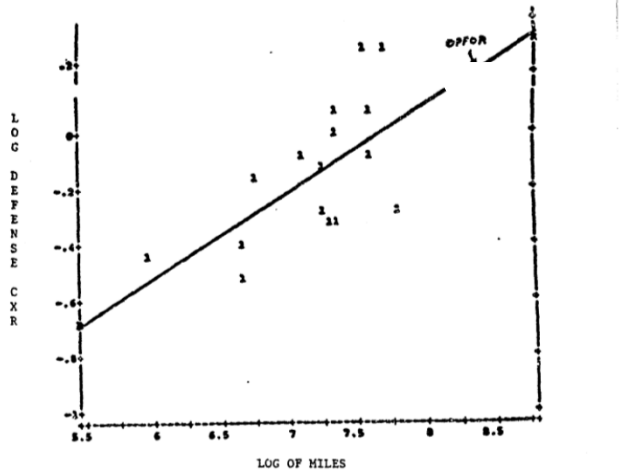
# Early Analyses of the Impact of Training on Aviation Performance

- Performance measures: operational readiness evaluation scores, carrier landing grades, bombing accuracy, airdrop accuracy, kill probability in air-combat exercises, accident rates, torpedo exercise scores
- Personnel included in analysis: pilots, co-pilots, navigators, sensor operators
- Measures of training: recent and career flying hours
- Analyses: Squadron and individual performance in a wide range of circumstances covering Navy, Marine Corps, and Air Force
- Finding: Both recent and career flying hours are generally significant. Career flying hours are usually more important.

# Early Analyses of the Impact of Training on Performance of Army Units

- Readiness measure: Unit performance at National Training Center (NTC) as assessed by observer/controllers
- Personnel included in analysis: brigade level
- Measures of training: miles driven before NTC rotation
- Analyses: Performance of seven brigades in the late 1980s
- Finding: operating tempo during preparation was a significant predictor of performance on both offense and defense




Exchange Ratio in Live-Fire Defense vs. Miles Driven in Training

# Training Technology Improves Performance: The Value of Simulators and Simulation

- Time spent in C-130 simulators improves the accuracy of airdrops
- Both career and recent simulator time improves bombing accuracy for F/A-18s
- Increased simulator time for enlisted acoustic operators improves P-3 torpedo exercise scores
- Participation in the Army's Simulation in Training for Advanced Readiness program significantly improved the performance of National Guard units at NTC
- Sonar technicians trained with Interactive Multisensor Analysis Training (IMAT) performed better than personnel with years of fleet experience

## IDA | Insights into Cost-Effectiveness

- A six percentage point increase in personnel experience is associated with a nine percentage point increase in ship availability. Increasing ship availability by buying more experience is much less expensive than increasing it by buying more ships.
- On the margin, an extra simulator hour may improve bombing and air drop accuracy more than an extra flying hour. Simulator time is less expensive.
- Comparison of payoff to tank training, both live and simulated, relative to buying more sophisticated equipment, was less clear.
- Performance gains from IMAT training are much less expensive than similar gains from improved hardware

# Individualized Computer-Aided Instruction Improves Performance and Is Less Expensive

- Research dates back to 1960s
- Rules of Thumb:
  - Can either reduce instructional time by one-third or increase skills and knowledge acquired by one-third
  - Can reduce cost of instruction by one-third
- Permits an approximation of one-on-one tutoring
- A recent test of DARPA's "Digital Tutor" (DT):
  - Program for training Navy information technicians
  - Students performed dramatically better on both written and practical tests

# Training Has Improved; New Technology Has Been Adopted

- Increased emphasis on instrumented, realistic training (e.g., Top Gun, National Training Center)
- Increased use of flight and other combat simulators
- Since 2004, the Training Transformation (T2) program has provided >$3 billion
  - Accreditation of the realism of training
  - Development of Joint LVC federation of simulations
  - Networked training to reduce transportation costs and simulate scarce, important assets
- Incorporation of computer-aided elements into individual training

# Sometimes Progress Seems Slow

- Some mission-essential tasks are difficult to train
  - Key players from other organizations and countries not available
  - Cyber training disrupts other training
- Unavailability of simulations and connectivity
- Legacy modes of training persist – e.g., traditional podium instruction
- Little systematic assessment
- Resources to improve training are not allocated on the basis of expected impact

## IDA | Impediments to Progress

- Mechanistic approach to determining training requirements (How much is enough?)
  - Tasks, conditions, and standards
  - Assessments of training performance at the task level
  - Objectives are set and achieved, but are they achieved in the most cost-effective way?
- Issue identification – “lessons learned” are merely observed, little follow-up
- Training performance information is not used in analysis
- Training managers are satisfied: if it ain’t broke, don’t fix it – but it could be better
- Leadership focus episodic
- Resource allocation decisions incremental
  - Lack of clear prioritization
  - Lack of follow-up

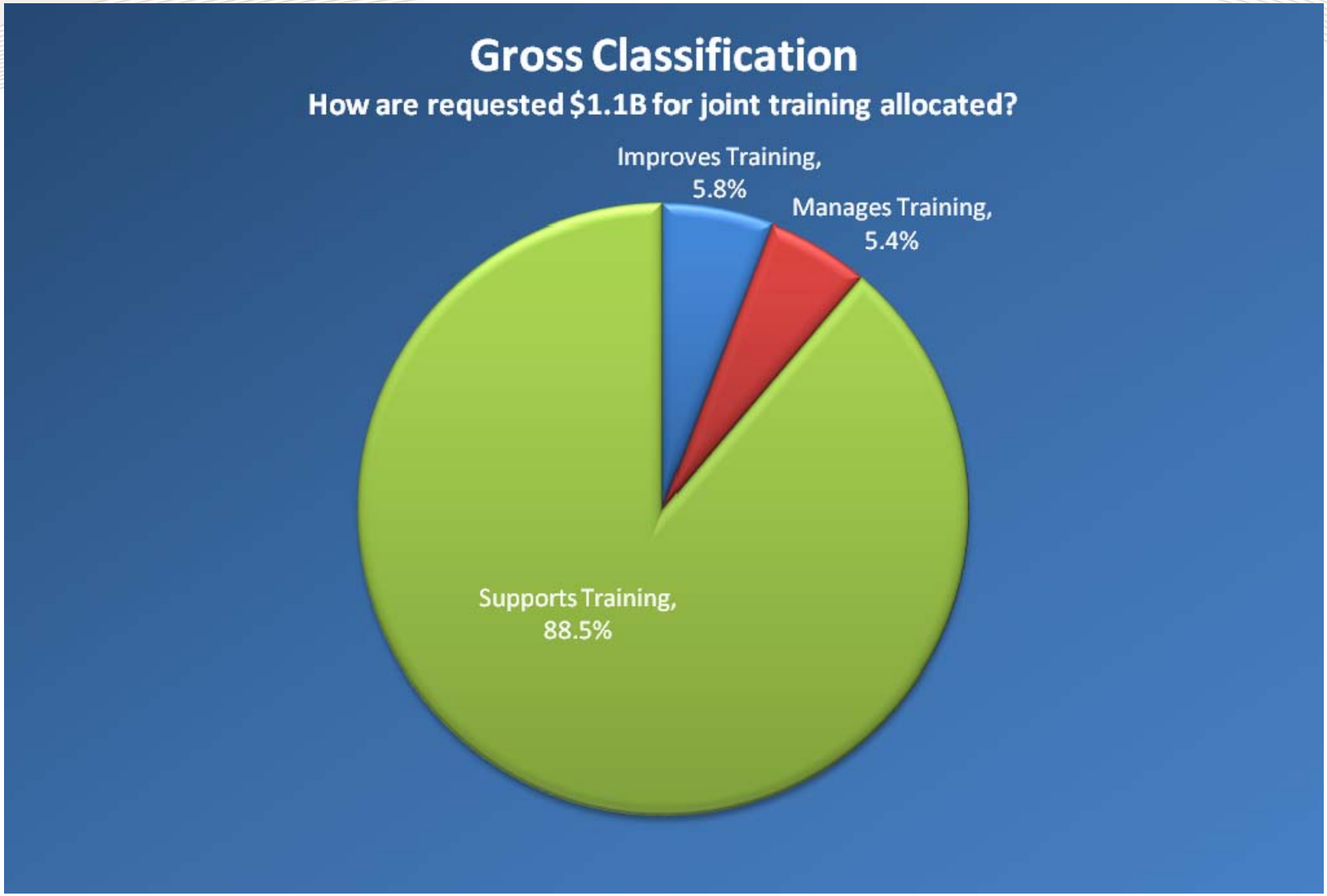
# IDA | An Innovative Approach to Resource Allocation

- The T2 program allocates $700 million a year to improve training
- Stakeholders (Services and Combatant Commands) submit proposals
- Proposals are reviewed by stakeholders collectively and prioritized
- Training leadership then makes final decisions
- Leadership is seeking to improve the analytic basis for its choices
- A new process is being adopted to provide an analytic framework for decision-making

# IDA | Elements of New Resource Allocation Process

- Categorize by functional emphasis: improve, support, or manage training
- Specify strategically chosen focus areas for investment
- Evaluate proposals with respect to focus areas
- Require every proposal to state measures of effectiveness
- Evaluate measures of effectiveness
- Track measures of effectiveness
- Use this information in building program

# IDA | Initial Categorization of Proposals



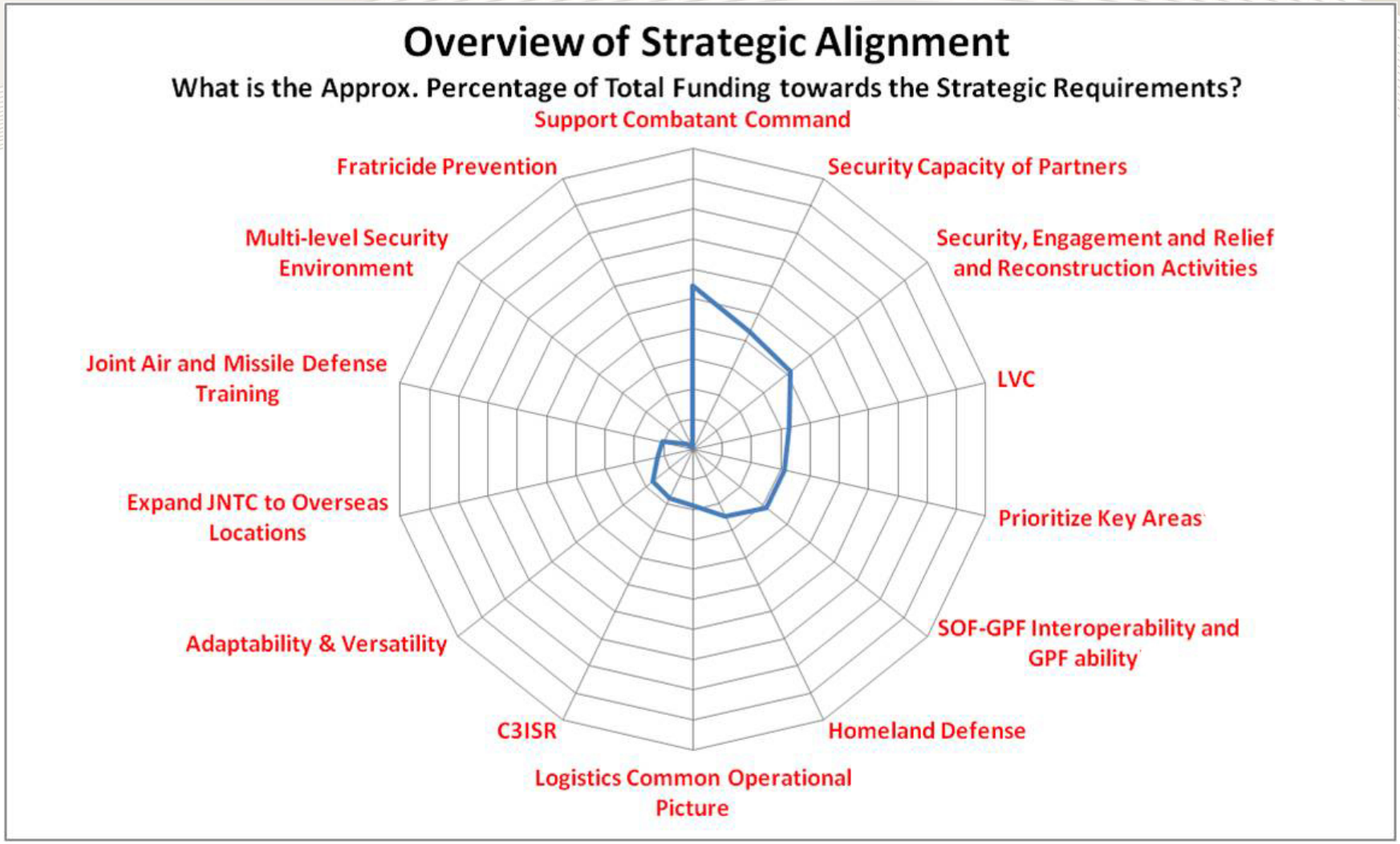
# IDA | Origin and Use of Focus Areas

- Focus areas are priorities for increased emphasis
- Approved by training leadership
- Based on high-level guidance documents
- Requesters will self-assess
- Training strategy office will review
- Two purposes
  - To illuminate goals of individual proposals
  - To assess overall program balance

# IDA | Focus Areas for Investment

- Train for Irregular Warfare Threats (counterterrorism, unconventional warfare, foreign internal defense, counterinsurgency and stability operations)
- Train for Operations to Deter and Defeat Aggression
- Enhance Integration with Partners
- Strengthen Security and Resilience at Home
- Improve Capabilities for Cyber, Space, and Information Operations
- Enhance Unit and Individual Adaptability
- Improve our Ability to Train Realistically and Efficiently

# IDA | Display of Emphasis Given to Priorities




- Illustrative, based on old set of priorities
- Allows identification of under-emphasized priorities

# Guidelines for Good Measures of Effectiveness (MOE)

- Content
  - Measurable
  - Credible (clear cause and effect)
  - Relevant (aligned with program goals)
  - Significant (important in representing performance)
  - Useful (provides actionable feedback)
  - Timely
  - Reliable (accurate)
  - Attainable (data can be gathered)
  - Cost-effective (not too expensive to gather)
- Structure
  - Quantifiable
  - Has threshold
  - Simple
  - Not anecdotal
- Language
  - Terms clearly defined
  - Understandable (to non-specialist)

Tracking MOEs should reduce the tendency to promise great things and not document their occurrence

## IDA | But It Is Not Only about Training

- Training is one way to improve military performance
- Others are larger forces, smarter people, more sophisticated equipment, job performance aids, and more spare parts
- Sometimes training is the most cost-effective way – and sometimes not
- We should compare the cost-effectiveness of investments along these different dimensions
- Usually we do not perform that comparison

## IDA | Some Interesting Results

- Are smarter tankers better tankers?
  - Yes, if they are in M60s
  - Not so much if they are in M1s
- Can job performance aids substitute for training?
  - At least sometimes
  - Junior F-16 repair technicians with an automated trouble-shooting system did as well as senior technicians without it
- How about training vs. more forces?
  - More training seems to increase available combat power more economically than larger forces, in some cases
  - Improving the supply system might be even better
- We should do more studies comparing the cost-effectiveness of investments across different dimensions
  - Our resource allocation processes are often stove-piped and comparisons of this sort don't come naturally

- Research has shown that:
  - Training matters
  - New technology helps
  - Training is often a cost-effective way to improve performance
- Concerning resource allocation:
  - It is often not guided by these insights
  - Funding decisions can be more output-oriented
  - Diverse ways of improving performance should be explicitly compared