December 2017

RAND CORPORATION

OBJECTIVE ANALYSIS.
EFFECTIVE SOLUTIONS.

Saving the Government Money

Recent Examples from RAND's Federally Funded Research and Development Centers

The RAND Corporation's three defense-based federally funded research and development centers (FFRDCs) help the government organizations responsible for U.S. national security meet challenges that call for both (a) sustained analytic attention from multidisciplinary teams over many years and (b) rock-solid trust engendered by rigorous safeguards against conflict of interest.

Defense-Based FFRDCs at RAND

Arroyo Center
Founded in 1982 at the Jet Propulsion Laboratory; moved to RAND in 1984
Sponsor: the U.S. Army

National Defense Research Institute (NDRI)
Founded in 1984 at RAND
Sponsors: the Office of the Secretary of Defense, the Joint Staff, the Unified Combatant Commands, the Navy, the Marine Corps, the defense agencies, and the defense Intelligence Community

Project AIR FORCE (PAF)
Founded in 1946 as Project RAND, which was renamed the RAND Corporation in 1948 upon RAND's organization as an independent nonprofit corporation
Sponsor: the U.S. Air Force

Through their enduring collaboration with defense policymakers, the three FFRDCs at RAND (see box) have developed unsurpassed expertise, or "research capital," on issues of defense policy and its interrelated technological, operational, and financial dimensions. Often, the FFRDCs apply this research capital by helping their Department of Defense (DoD) sponsors save the government money while solving national security problems.

The table on page 2 lists illustrative projects that have helped save the government money or have the potential to do so. Subsequent pages contain summaries of the projects. (When publicly accessible documents are available, their references and links also appear.)

These projects are representative of numerous RAND analyses that have been conducted within the FFRDCs and have yielded similar benefits over the years. Together, the analyses account for billions of dollars in savings and cost avoidance.

Ways That RAND Analyses Have Saved DoD Money

RAND projects that have helped the government with cost savings and cost avoidance fall into three classes:

- Savings have been achieved or are ongoing.
- Savings have been projected and will accrue, assuming the government follows RAND's recommendations.
- Savings have been enabled following RAND's independent validation.

AN OVERVIEW OF RECENT SAVINGS ACHIEVED, PROJECTED, OR VALIDATED BY RAND RESEARCH

SAVINGS ACHIEVED OR ONGOING	
Slowing the Rate of Increase in Military Pay	**$17 billion** in savings from 2012 through 2021
Integrating the DoD Supply Chain	**$100 million to $200 million per year** in savings under way
Fuel Reduction for the Mobility Air Forces	Up to **$60 million per year** in savings under way

SAVINGS PROJECTED	
Aircraft Carrier Alternatives	**$32 billion** in projected savings through 2064
Reforming Military Retirement	**$2.3 billion to $7.7 billion per year** in projected savings
Making the Reserve Retirement System Similar to the Active System	**$790 million per year** in projected savings
Beddown Alternatives for the F-35	**$580 million per year** in projected savings, plus **$200 million** in one-time projected savings
Block Buys of F-35 Joint Strike Fighters (JSFs)	**$1.6 billion to $2.2 billion** in projected savings over three years
Restructuring Voluntary Separation Incentive Pay	**$1.2 billion to $2.4 billion** in projected cost avoidance over five years
Reshaping Air Force Agile Combat Support (ACS) Forces	**Hundreds of millions of dollars per year** in projected savings
Optimizing Army Use of Recruiting Resources	**Hundreds of millions of dollars per year** in projected savings
Reducing Procurement and Sustainment Costs of JSF Training Aircraft	**$550 million to $800 million** in projected savings
Enhanced Use of PMA Parts and DER Repairs in Commercial-Derivative Military Engines: Two Case Studies (CF6-50C2 and CFM56-2A/2B)	Upward of **$80 million per year** in projected savings
Avionics Upgrades for Surveillance Technology Modernization	**$36 million per year** in projected cost avoidance over the life of four airframes
Consolidating Maintenance Career Fields	**$30 million per year** in projected savings without reducing readiness
Mitigating Risks and Costs Associated with Ballistic Glass Delamination	**$118 million** in potential cost avoidance over ten years
Evaluation of F-35C Fleet Replacement Squadron Fighter-Support Aircraft Options	**$20 million to $52 million** in projected cost avoidance

SAVINGS VALIDATED	
Increasing Reserve Component Force Management Flexibility at Lower Cost	Estimated **$200 million to $300 million per year** in savings validated
Reorganizing the Air Force Materiel Command	**$100 million per year** in savings validated
Air Force Compliance with Headquarters Savings Goals	**$176 million** in savings validated

NOTE: Dollar amounts are in nominal dollars current with the year of the study or savings. Some savings are thus underestimated in 2017 terms.

SAVINGS ACHIEVED OR ONGOING

Slowing the Rate of Increase in Military Pay (2012)

$17 billion in savings from 2012 through 2021

Early this decade, budgetary pressures to reduce the federal deficit raised the question of whether DoD could realize savings in the military personnel budget without jeopardizing the nation's ability to sustain a high-quality all-volunteer force. NDRI's 2012 study answering that question pointed to two favorable trends. First, manpower demand would decrease, by some 80,000 soldiers and 20,000 marines, simultaneous with the drawdown in Afghanistan. Second, the factors influencing supply were also favorable: Military pay had grown greatly relative to civilian pay in the preceding decade, the services' active and reserve components were meeting or exceeding their numerical recruiting goals, and at the same time recruit quality had increased. Thus, the conditions were right for slower-than-usual increases in basic pay. The evidence from the NDRI study indicated that the nation had taken care to pay its service members well, compared with civilian benchmarks, and that some easing of the growth in compensation could occur without putting force management at risk.

To slow the rate of pay increases, NDRI examined several options, including a multiyear period of lower-than-usual increases in basic pay or a one-year freeze in basic pay. Over the period from 2012 to 2015, in fact, Congress acted to slow the increases in basic pay. The increases totaled 2 percentage points less than they otherwise would have been, and the lower resulting pay scales also implied lower subsequent basic pay costs. **These ongoing reductions are now generating an estimated cost savings of $17 billion over ten years, through 2021, as forecast by the Congressional Budget Office.**

Should the Increase in Military Pay Be Slowed? James Hosek et al., 2012, www.rand.org/t/TR1185

Integrating the DoD Supply Chain (2011–2015)

$100 million to $200 million per year in savings under way

From 1995 to 2010, DoD made a number of supply chain improvements, increasing performance and efficiency. However, these improvements aimed at enhancing processes *within* functions rather than *across* the entire supply chain. An NDRI team showed that large opportunities for improvement remained by taking a "total systems view" and formulating solutions from a cross-functional perspective spanning DoD organizations and suppliers.

For instance, NDRI worked with the Defense Logistics Agency (DLA) to create stock-positioning logic for minimizing total *system* costs. The core principle in this logic was the need to incorporate all functional costs for systemwide optimization rather than minimize the cost of each isolated function, which can lead to suboptimal system-level outcomes. DLA adopted this new logic into its resource planning system. Through extensions of this logic, NDRI also proposed both a long-term plan for DoD's strategic distribution network (affecting the number and roles of major DoD distribution hubs) and a scheduled-truck planning model. These proposals were adopted as well.

In 2014, the NDRI recommendations for optimizing total supply chain outcomes and costs were incorporated into the *DoD Supply Chain Materiel Management Procedures*. **The associated DoD innovations are now generating savings of $100 million to $200 million per year.** These innovations have a direct impact on military personnel deployed to conflict zones by helping ensure that they have what they need, when they need it—all at less cost.

DoD Depot-Level Reparable Supply Chain Management: Process Effectiveness and Opportunities for Improvement, Eric Peltz et al., 2014, www.rand.org/t/RR398

Improving DLA Supply Chain Agility: Lead Times, Order Quantities, and Information Flow, Eric Peltz et al., 2015, www.rand.org/t/RR822

Integrating the Department of Defense Supply Chain, Eric Peltz and Marc Robbins, 2012, www.rand.org/t/TR1274

Fuel Reduction for the Mobility Air Forces (2015)

Up to $60 million per year in savings under way

Reducing aviation fuel use is an ongoing goal for military and civil operators, and the Air Mobility Command has felt increasing pressure to further reduce fuel use by implementing and following known best practices. Although the Air Force has achieved significant fuel reductions in recent years, it must continue to pursue cost-effective options to reduce fuel use. A PAF team considered 16 options for reducing fuel use and determined that 12 of these were cost-effective. However, about half of these had some negative implications. At 2015 fuel prices, six options were both cost-effective and could be reasonably implemented: engine-out taxiing, always flying at optimum altitudes and speeds, continuing to reduce aircraft weight, reducing the use of aircraft auxiliary power units (APUs) by using ground equipment instead, ensuring that loads are properly balanced, and installing microvanes on the C-130 fleet. **Implementation of all**

these options is in various stages of progress. Together, they could save up to $60 million per year in fuel costs at 2015 fuel prices.

Fuel Reduction for the Mobility Air Forces, Christopher A. Mouton et al., 2015, www.rand.org/t/RR757

SAVINGS PROJECTED

Aircraft Carrier Alternatives (2017)

$32 billion in projected savings through 2064

In executing its long-term shipbuilding plan, the U.S. Navy faces financial challenges that require it to consider lower-cost options for building its most-expensive platforms, such as aircraft carriers. An NDRI project examined potential alternatives for replacing the aging *Nimitz*-class nuclear-powered aircraft carriers (CVNs) with ships that would have lower procurement costs than the *Ford*-class CVNs currently in production. The *Nimitz*-class CVNs will reach the end of their planned service lives in 2030 and beyond.

The NDRI team compared the cost and capabilities of the *Ford*-class CVNs with the cost and capabilities of four carrier variants. Among the options were two large-deck platforms that would retain the capability to launch and recover fixed-wing aircraft and two smaller platforms capable of supporting only short takeoff and vertical landing (STOVL) aircraft. One of the options with the intact fixed-wing capability would also allow considerable savings across the ship's service life, would create capability shortfalls but none so severe that they would need to be filled elsewhere in the joint force, and would be a viable alternative to consider for further exploration. Compared with the 100,000-ton *Ford*-class carrier, the promising vessel would be a 70,000-ton USS *Forrestal*-size carrier with a hybrid nuclear-powered integrated propulsion system.

Whereas the long-range cost of an 11-ship *Ford*-class program would be $140 billion through 2064, the long-range cost of an 11-ship *Forrestal*-size fleet would be $108 billion, or 23 percent less. Thus, **the projected savings would be $32 billion over the next five decades.** This significant savings would need to be weighed against the potential loss of warfighting capabilities in terms of speed, survivability, and sortie generation.

*Future Aircraft Carrier Option*s, Bradley Martin and Michael McMahon, 2017, www.rand.org/t/RR2006

Reforming Military Retirement (2015)

$2.3 billion to $7.7 billion per year in projected savings

Over the past several years, NDRI has provided extensive analysis to support military retirement reform efforts in DoD, including analytic support during internal deliberations of the Military Compensation and Retirement Modernization Commission (MCRMC). Using its Dynamic Retention Model, NDRI analyzed many retirement plan alternatives to replace the traditional defined benefit system. One of those alternatives was MCRMC's retirement reform plan, which blends a defined benefit plan, defined contribution plan, and continuation pay in the 12th year of service. One feature of MCRMC's plan is that members of the active component can choose how to structure the defined benefit portion of the plan, giving them choice over the timing and amount of benefit payments. The NDRI analysis of this plan showed that the current size and experience mix of the force could be sustained while decreasing the overall cost of the military compensation and retirement systems. **In the long run, the cost savings of the MCRMC plan could range from $2.3 billion to $7.7 billion per year, depending on how the plan is ultimately structured.** For instance, the services are currently determining their respective continuation pays, which will influence the rate at which members who are grandfathered under the legacy retirement system will switch to the blended system, thus affecting the total projected savings. The new retirement system will take effect January 1, 2018.

Reforming Military Retirement: Analysis in Support of the Military Compensation and Retirement Modernization Commission, Beth J. Asch et al., 2015, www.rand.org/t/RR1022

Making the Reserve Retirement System Similar to the Active System (2014)

$790 million per year in projected savings

The Arroyo Center analyzed how offering a retirement annuity immediately to vested members of the Army reserve component (RC)—both enlisted personnel and officers—would affect RC participation and Army active component (AC) retention, both in the steady state and during the transition period. Arroyo researchers also estimated the change in personnel costs in the steady state and considered how quickly RC participation and AC retention would change if RC members were given a choice between the two retirement systems.

Modeling results suggest that offering an immediate retirement annuity would change retention patterns among both the RC and AC forces. Overall, the RC force would decrease in size, become more junior, and leave the Army with less seniority. The

policy would have small but discernible effects on AC retention: It would increase in midcareer but decrease near and immediately after retirement vesting. In the steady state, Army personnel costs would fall, largely because the AC force would become more junior, more AC members would separate prior to 20 years of service, and those who do make it to 20 years of service would tend to leave the Army with less seniority. Decreases in RC costs would also contribute to the cost savings.

If AC force size were held constant, and if continuation pay were offered to sustain RC force size, total cost savings for the Army would be $790 million annually in the steady state. Results are expected to be qualitatively similar for all the other services.

Making the Reserve Retirement System Similar to the Active System: Retention and Cost Estimates, Michael G. Mattock et al., 2014, www.rand.org/t/RR530

Beddown Alternatives for the F-35 (2013)

$580 million per year in projected savings, plus $200 million in one-time projected savings

As currently planned, the F-35 Joint Strike Fighter is the costliest aircraft acquisition program in DoD history. One approach to ensuring program affordability could be to increase the number of Primary Aerospace Vehicles Authorized (PAA) per F-35 combat-coded squadron, with a resulting reduction in the number of such squadrons, which could reduce a variety of costs. PAF explored the impact of increasing the PAA per squadron, adjusting the mix of PAA across the active and reserve components, and adjusting the percentage of the active component PAA assigned to home-station locations in the continental United States.

Researchers considered 28 beddown alternatives, with a maximum of 36 PAA per squadron, and determined that all beddowns could satisfy surge deployment requirements and most could also satisfy rotational requirements. **Raising the F-35 squadron sizes from 24 to 30 PAA in the active and reserve components while raising the squadron sizes from 18 to 24 PAA in the Air National Guard could save more than $200 million in one-time support equipment requirements, more than $400 million in annual pilot absorption flying costs, more than $180 million in annual maintenance manpower costs, and more than 10 percent in annualized facilities costs.** The projected savings would increase if the Air Force were to select a posture with 36 PAA in the active and reserve squadrons and 24 PAA in the Air National Guard squadrons.

Assessment of Beddown Alternatives for the F-35, Ronald G. McGarvey et al., 2013, www.rand.org/t/RR124

Block Buys of F-35 Joint Strike Fighters (2016)

$1.6 billion to $2.2 billion in projected savings over three years

In 2015, the United States and partner governments in the F-35 program began considering the use of a three-year block buy contract for procuring the F-35 aircraft in production lots 12–14 (corresponding to FYs 2018–2020). The proposal is intended to reduce costs relative to a series of annual contracts for the F-35 program.

As part of its decision on whether to pursue the block buy, the F-35 Joint Program Office (JPO) asked PAF to assess the potential cost savings available to the F-35 program. PAF's savings estimate, which focused on recurring flyaway costs, was approximately $2.2 billion, or a 4.8-percent savings relative to the combined cost of annual contracting. These savings were computed relative to an annual contracting baseline cost estimate provided by the F-35 JPO. In addition, PAF examined an alternative "hybrid" block buy approach that is under consideration, in which a subset of countries would enter a block buy contract for lots 12–14, with the remaining countries possibly entering the contract for the latter two lots. **Under this hybrid approach, the projected savings would be reduced to $1.6 billion to $1.9 billion.**

The PAF team recommended that the JPO consider, as part of a complete business case analysis, the potential risks associated with block buy contracts as well as the projected cost savings.

Restructuring Voluntary Separation Incentive Pay (2016)

$1.2 billion to $2.4 billion in projected cost avoidance over five years

DoD has reduced its civil service workforce since 2011 and plans to continue this drawdown through 2021. An important tool for mitigating the adverse effects of the drawdown is the Voluntary Separation Incentive Payment (VSIP), which is paid to civil service personnel who accept a buyout offer and voluntarily leave federal service. In practice, VSIP is typically accompanied by Voluntary Early Retirement Authority (VERA), which allows civil service employees to retire as early as age 50 with 20 years of service rather than at age 60 with 20 years of service. However, VSIP is currently capped at $25,000, the level authorized by Congress in 1993. The cap would need to have risen to $41,000 by 2015 to have maintained its real value as in 1993. The decline in the real value of VSIP has led to questions about

whether it should be increased, whether it is effective in inducing adequate voluntary separations, and whether it is cost-effective relative to other downsizing strategies, especially involuntary separations.

An NDRI study found that raising the VSIP cap, when combined with VERA, would be the most cost-effective way of achieving larger drawdowns. The savings would take the form of costs avoided as a result of eliminating positions and their salaries, Thrift Savings Plan contributions, and defined benefit accrual costs paid to the Civil Service Retirement and Disability Fund. In fact, the net cumulative savings over five years would be greater at higher VSIP levels. Relative to the current civil service reductions with a VSIP cap of $25,000, **the projected additional cost avoidance over five years would range from $1.2 billion to $2.4 billion, given increased VSIP caps of $41,000 and $55,000, respectively.** With the increased caps, VSIP would provide stronger incentives for voluntary separations and would help to avoid or diminish the use of involuntary separations.

Workforce Downsizing and Restructuring in the Department of Defense: The Voluntary Separation Incentive Payment Program Versus Involuntary Separation, Beth J. Asch et al., 2016, www.rand.org/t/RR154

Reshaping Air Force Agile Combat Support (ACS) Forces (2014)

Hundreds of millions of dollars per year in projected savings

Operations Iraqi Freedom and Enduring Freedom imposed unique demands on Air Force agile combat support (ACS) forces and put stress on several career fields. PAF was asked to analyze how well the Air Force's ACS forces are postured to meet emerging requirements and to suggest ways to improve that posture.

The Air Force sizes and shapes many non-maintenance ACS career fields to meet the requirements of home-station installation operations rather than expeditionary operations. This often results in a discrepancy between the supply of ACS forces and operational expeditionary demands. PAF developed new metrics to quantify expeditionary ACS capacity, assessed the capacity of the ACS manpower mix to support expeditionary operations, and assessed the benefits of alternative ACS manpower mixes in terms of recurring savings (maintaining constant home-station manpower authorizations).

PAF's analysis revealed that, by rebalancing ACS manpower, the Air Force could both reduce military end strength and increase expeditionary capacity. Although active-duty end-strength reductions would be accompanied by civilian billet increases (to maintain home-station support), each rebalance option with end-strength reductions would realize net cost reductions while increasing expeditionary capacity—up to a point. An ACS rebalance that maximizes expeditionary capacity might afford little reduction in end strength or savings. **But a rebalance that includes, for example, a 25-percent reduction in military end strength from that maximum-capacity alternative could still result in a greater-than-50-percent increase in expeditionary capacity over the current force—and more than $300 million in annual savings.** Further savings could be achieved from further end-strength reductions, if the Air Force is satisfied with its current expeditionary capacity.

Balancing Agile Combat Support Manpower to Better Meet the Future Security Environment, Patrick Mills et al., 2014, www.rand.org/t/RR337

Optimizing Army Use of Recruiting Resources (2016)

Hundreds of millions of dollars per year in projected savings

The Army spent an average of $1.5 billion per year on recruiting from FY 2001 to FY 2014. Most of this money was spent on recruiters, enlistment bonuses, and television advertising. The Arroyo Center showed that if the Army could use the optimal mix of these resources, it could dramatically reduce the cost of recruiting, particularly in difficult recruiting years, when costs have approached $2 billion annually.

However, what constitutes the optimal mix of resources varies from year to year. It depends on a number of factors, including the number of enlistments needed, enlistment eligibility policies, and the economy. In general, recruiting is easier when job opportunities in the civilian economy are poor. Recruiting becomes more difficult as the economy improves, the number of recruits needed increases, or eligibility is tightened.

Over a wide range of conditions, recruiters and advertising are relatively inexpensive in comparison with enlistment bonuses. However, increased use of recruiters or advertising requires sufficient lead time. Therefore, for the optimal mix to be fully achievable, the Army must be proactive in its resourcing and reasonably accurate in its planning assumptions about recruiting goals and economic conditions.

The Arroyo Center developed a model to help Army planners identify the optimal mix of resources and enlistment eligibility policies for different scenarios. **By using the Arroyo Center model, which is being developed into an interactive tool, the Army could reduce its recruiting expenditures by hundreds of millions of dollars per year**, depending on economic conditions, recruiting goals, and timing.

Recruiting Strategies to Support the Army's All-Volunteer Force, Bruce R. Orvis et al., 2016, www.rand.org/t/RR1211

Reducing Procurement and Sustainment Costs of JSF Training Aircraft (2016)

$550 million to $800 million in projected savings

The F-35 Joint Strike Fighter (JSF) is expensive to acquire and sustain. Because a large number of the aircraft will be used for initial qualification training (IQT) of pilots, the JSF Joint Program Office asked an NDRI team to examine the potential for cost savings on the training aircraft. The team found two areas of potential savings: reducing alternate mission equipment (AME) and managing stealth characteristics.

AME refers to military equipment—for example, weapon-carrying pylons—that can be added to or removed from a weapon system depending on mission needs. Evaluation of the training syllabus and discussions with training subject-matter experts found that not all of the F-35's ordnance stations are used for IQT. NDRI analysts focused on the procurement of the F-35A, which is the F-35 variant for the U.S. Air Force, because the Air Force is buying the most training aircraft and does not normally rotate its training aircraft through operational squadrons. The Air Force could save money by limiting the AME procurement for training squadrons to only what is required by the IQT syllabus. The range of potential life-cycle cost savings from reducing AME procurement and storage for the F-35A is almost $500 million.

As for managing the stealth characteristics, the F-35A's radar cross-section (RCS) is generally not measured during training sorties. Moreover, the effect on the RCS of defects in maintaining the aircraft's low-observable (LO) signature is not displayed to the pilot in training, and other factors further limit the utility of LO maintenance in training squadrons. Therefore, the potential may exist to defer or remove some or all of the LO maintenance tasks for training aircraft, thereby reducing the manpower, parts, and supplies required for maintaining the aircraft's LO signature. As the F-35 is still in development, the alternative LO management approach must be carefully monitored, particularly to evaluate the LO degradation that may occur with the aircraft flying in its full operational envelope. Nonetheless, a conservative estimate of the potential life-cycle savings from reduced LO maintenance, based on manpower savings alone, ranges between $62 million (a 5-percent manpower reduction) and $308 million (a 25-percent manpower reduction).

Overall, the total potential savings from these two strategies ranges from about $550 million to $800 million.

Enhanced Use of PMA Parts and DER Repairs in Commercial-Derivative Military Engines: Two Case Studies (CF6-50C2 and CFM56-2A/2B) (2015)

Upward of $80 million per year in projected savings

The U.S. Air Force spends roughly $3 billion per year on aircraft engine maintenance. The Navy also spends hundreds of millions of dollars on aircraft engine maintenance each year. NDRI analyzed the extent to which DoD might decrease its operating and support costs, without loss of safety or reliability, through an increased use of Parts Manufacturer Approval (PMA) parts and Designated Engineering Representative (DER) repairs on military engines that share many of the same parts used on commercial jet engines. PMA parts and DER repairs are provided by third-party companies and certified by the Federal Aviation Administration.

The NDRI team focused on two case study engines: the CF6-50C2 and the CFM56-2. The CF6-50C2 (or F103) is used on the Air Force KC-10. The CFM56-2 powers the Navy E-6B and Air Force KC-135 and RC-135; the CFM56-2A is used on the Navy E-6B, and the CFM56-2B (or F108) is used on the Air Force KC-135 and RC-135.

The NDRI team found the most compelling evidence of potential cost savings to be on the Air Force F103 engine used on the KC-10. The analysis of F103 overhaul costs when using PMA parts and DER repairs found savings per overhaul of roughly 20 to 25 percent on average, or over $1 million per overhaul, totaling over $200 million from FY 2010 to FY 2013 (in FY 2014 dollars), or an average of $50 million per year. The NDRI team also found that purchases of commercial, used, and refurbished parts for six F108 National Stock Numbers (NSNs) in FY 2012 and FY 2013 resulted in an average savings of 61 percent on those items, or over $64 million (in FY 2014 dollars) over the two-year period. With over half of Air Force spending on engine maintenance being paid for commercial-derivative engines, **NDRI estimated that if DoD made greater use of commercial refurbished parts or of PMA parts and DER repairs for its commercial-derivative military engines, it could save upward of $80 million each year.**

Applying Best Practices to Military Commercial-Derivative Aircraft Engine Sustainment: Assessment of Using Parts Manufacturer Approval (PMA) Parts and Designated Engineering Representative (DER) Repairs, Mary E. Chenoweth et al., 2016, www.rand.org/t/RR1020z1

Avionics Upgrades for Surveillance Technology Modernization (2015)

$36 million per year in projected cost avoidance over the life of four airframes

The ongoing modernization of the National Airspace System (NAS) aims to increase NAS capacity, reduce flight delays, improve aviation safety, and minimize fuel use and emissions. A key component of the transition to the Next Generation Air Transportation System within the United States is Automatic Dependent Surveillance–Broadcast (ADS-B) Out, a surveillance technology that allows for more-precise tracking of aircraft by air traffic controllers. Avionics upgrades are necessary for Air Force trainer and fighter fleets to meet ADS-B Out equipage requirements and continue operating beyond 2020 within much of the NAS as they do today. Failure to modernize would lead to increased fuel use and flying hours, resulting in higher operations and support (O&S) costs.

PAF assessed the cost-effectiveness of existing modernization plans for six aircraft types: the T-1A, T-6A, T-38C, F-15C/D/E, F-16C/D, and F-22. PAF found modernization to be cost-effective for two of the trainers—the T-1A and T-38C—with a payback period of approximately three years for each fleet. PAF also found modernization to be cost-effective for two of the fighters—the F-16C/D and F-22—with payback periods of approximately two and eight years, respectively. In the case of the fighters, however, the modernization plans at the time of the analysis were preliminary, consisting of low-cost, software-only upgrades that would not alter the external characteristics of the aircraft.

The analysis showed that modernization for the T-1A would cost $33 million but yield an annual cost avoidance of $11 million; for the T-38C, the cost would be $21 million, with an annual benefit of $7 million; for the F-16C/D, a cost of $36 million and an annual benefit of $16 million; and for the F-22, an upfront cost of $15 million, with an ongoing annual benefit of $2 million. In sum, **total upfront modernization costs of $105 million for four airframes would avoid ongoing O&S costs of $36 million per year.**

Consolidating Maintenance Career Fields (2016)

$30 million per year in projected savings without reducing readiness

PAF analyzed the potential consolidation of Air Force maintenance specialties for the KC-135 fleet. Such a consolidation would entail additional costs, because the maintainers would need to be trained across a broader range of skill sets. But it would also yield benefits, because each maintainer would be able to carry out a wider range of maintenance tasks, reducing the number of maintainers needed to ensure that all tasks could be done in a timely fashion. The analysis found that **such consolidation for the active-duty KC-135 fleet at three main operating bases, at which 90 KC-135s are based, could save $30 million per year without reducing readiness.** Alternatively, $20 million could be saved per year while *increasing* sortie generation capacity by 7 to 10 percent. PAF expects that similar savings opportunities could exist for the new KC-46 tanker, though not enough data on its maintenance requirements were available in time for the analysis.

Consolidating Air Force Maintenance Occupational Specialties, Thomas Light et al., 2016, www.rand.org/t/RR1307

Mitigating Risks and Costs Associated with Ballistic Glass Delamination (2017)

$118 million in potential cost avoidance over ten years

Over the course of operations in Afghanistan and Iraq, the U.S. Marine Corps identified a need for ballistic glass to be installed on the windshields and side-door windows of ground support vehicles to protect against bullets and other projectiles fired by insurgents. This requirement was satisfied. But while the glass has provided ballistic protection and proved reliable as a safety measure, Marine Corps operating units have encountered another problem: delamination, a chemical-mechanical process that mars the ballistic glass with clouds, bubbles, and spots that obscure the drivers' views. The causes of delamination remain under investigation, but scientists suspect that the contributing factors could include inappropriate assembly during manufacturing and exposure to heat and moisture after production. Regardless of the cause, delamination generates the unplanned cost burden of replacing or repairing the obscured ballistic glass.

An NDRI study estimated the extent of the problem (by inspecting a sample of more than 1,000 Marine Corps vehicles), assessed the speed of delamination and subsequent demands for windshield replacements or repairs, developed a simulation model to compare the risks and costs of six mitigation scenarios over a ten-year period, and identified steps the Marine Corps can take to mitigate the risks and costs. For example, immediately replacing each obscured windshield would result in 100 percent of the vehicles being available for deployment at an estimated cost of $272 million over ten years. In contrast, replacing only the lower-cost windshields (on Humvees) while repairing the higher-cost windshields (on other vehicles) would still result in 100 percent of the vehicles being available for deployment but would cost an estimated $154 million over ten years. **Thus, the latter scenario would potentially mitigate all risk while avoiding $118 million in costs.** The four other mitigation

scenarios would either leave large percentages of the vehicles unavailable for deployment, rely heavily on promising yet unproven repair technologies, or cost more money.

Addressing Ballistic Glass Delamination in the Marine Corps Tactical Vehicle Fleet: Implications for Resourcing and Readiness, Ellen M. Pint et al., forthcoming.

Evaluation of F-35C Fleet Replacement Squadron Fighter-Support Aircraft Options (2014)

$20 million to $52 million in projected cost avoidance

The Navy and Marine Corps are in the process of fielding the F-35C Joint Strike Fighter aircraft, an advanced fighter with low-observable characteristics. The F-35C poses some challenges in the area of "adversary" fighter-support aircraft that are needed for training. The F-35C is considered to be an option for the adversary role, which could increase the number of F-35C flight hours, aircraft required, and wear and tear on the aircraft, thus depleting its useful service life. Moreover, the F-35C is an expensive aircraft to operate. The research objective was geared to examine the demand for support aircraft, the potential for alternative aircraft to support training, the costs of alternative aircraft, and the potential cost avoidance that could be achieved by using aircraft other than an F-35 in the adversary role. NDRI analysts concluded that alternative aircraft options do exist (with some tradeoffs), and cost avoidance could be achieved through their use. **In the aggregate, the use of aircraft other than the F-35C as adversary fighters could result in cost avoidance ranging from $20 million to $52 million (over the time period of FY 2013 to FY 2028), depending on the airframe used.**

SAVINGS VALIDATED

Increasing Reserve Component Force Management Flexibility at Lower Cost (2012)

Estimated $200 million to $300 million per year in savings validated

Because reserve component (RC) members were increasingly being used in an operational capacity, the 11th Quadrennial Review of Military Compensation (QRMC) of 2012 proposed paying reservists daily basic pay and allowances in the same way as active component (AC) members, regardless of type of duty. To analyze this new compensation policy, NDRI used a stochastic dynamic programming model to simulate the effects of 11 variants of the proposal on AC retention, RC participation, and cost relative to the prior approach. The new QRMC approach changed daily compensation, points earned toward retirement, when retirement could be taken, and supplemental pay. NDRI found that the new approach could meet RC force requirements, even without a decrease in retirement age, but that supplemental pay was critical to ensuring this. Another advantage of the new compensation policy was that it offered the opportunity for enhanced force management flexibility as force requirements and economic conditions changed. NDRI found that the new approach—with supplemental pay set to hold RC prior force size constant—was **less costly than the baseline by $200 million to $300 million annually**.

Reserve Participation and Cost Under a New Approach to Reserve Compensation, Michael G. Mattock et al., 2012, www.rand.org/t/MG1153

Reorganizing the Air Force Materiel Command (2012)

$100 million per year in savings validated

Spending cuts imposed by the Budget Control Act of 2011 resulted in the need to significantly reduce civilian authorizations at the Air Force Materiel Command (AFMC). The command's leadership responded with a major reorganization to reduce staff functions while implementing the Office of the Secretary of Defense's product support business model, which keeps cradle-to-grave weapon system program management under the Service Acquisition Executive. Several members of Congress had concerns about how the reorganization might affect weapon system sustainment and, through the National Defense Authorization Act for FY 2012, directed the Secretary of the Air Force to have an FFRDC review the proposed reorganization.

In January 2012, PAF was tasked to conduct this review, which included an analysis of proposed manpower savings and an assessment of the impact on weapon system life-cycle management and support to the warfighter. **PAF verified manpower savings of approximately $100 million per year resulting from the reorganization** and recommended some additional process enhancements. AFMC has implemented some of the recommendations, which have the potential to enhance support to warfighters and further improve efficiencies. In particular, the House Armed Services Committee noted that AFMC was implementing a PAF recommendation to develop and use a suite of metrics to track mission performance against goals and thus facilitate root-cause analysis of any inefficiencies resulting from the reorganization.

Air Force Materiel Command Reorganization Analysis: Final Report, Robert S. Tripp et al., 2012, www.rand.org/t/MG1219

Air Force Compliance with Headquarters Savings Goals (2016)

$176 million in savings validated

In the FY 2014 National Defense Authorization Act, Congress instructed the Secretary of Defense to streamline DoD and military headquarters. Both in anticipation of this order and in response to it, then-Secretary of Defense Chuck Hagel directed a 20-percent reduction in headquarters spending across DoD by 2019. The Air Force asked PAF to assess the Air Force's effort in reducing its major headquarters spending and to independently verify its headquarters reductions.

The Air Force endeavored to achieve these reductions by the end of FY 2015 (when compared with its plans for FY 2018). The Air Force determined that it needed to reduce headquarters staffs by about 3,000 personnel, and PAF confirmed that it did. Compared with the FY 2018 authorized end strength of 13,847, the FY 2016 end strength of 10,869 represented a management headquarters reduction of 21.5 percent. Moreover, **compared with the FY 2018 baseline budget, the FY 2016 budget for Air Force headquarters authorized end strength was lower by $176 million, or 21 percent, as validated by PAF.**

The PAF team concluded that the Air Force not only achieved its planned 20-percent reduction in both end strength and spending but also that all major commands contributed to those savings. The Air Force's approach to reducing its headquarters management functions included many sound practices, such as identifying processes to streamline information flow and eliminate work, eliminating or combining redundant organizations, and ensuring work is conducted at an appropriate organizational level. However, sound practices were not applied consistently across the Air Force; different major commands employed different strategies with differing results.

An Independent Assessment of Air Force Compliance with Headquarters Reduction Goals, John A. Ausink, et al., 2016, www.rand.org/t/RR1480

Additional information about the projects highlighted
in this document can be obtained by contacting the following:

For the RAND Arroyo Center
Tim Bonds, Director
310.393.0411 x5213
bonds@rand.org

For the RAND National Defense Research Institute
Jack Riley, Director
412.683.2300 x4956
riley@rand.org

For RAND Project AIR FORCE
Ted Harshberger, Director
310.393.0411 x7273
tharsh@rand.org

CP-485 (12/17)