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Analyses for the National Commission on the Structure of the Air Force

(Revised)

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April 2014

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IDA Document NS D-5130
Log: H 14-000475

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About This Publication

This work was conducted by the Institute for Defense Analyses (IDA) under contract HQ0034-14-D-0001, Project AF-7-3752, "USAF Force Structure Assessment," for the Director of the National Commission on the Structure of the Air Force. The views, opinions, and findings should not be construed as representing the official position of either the Department of Defense or the sponsoring organization.

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Executive Summary

This paper presents four short analyses performed by the Institute for Defense Analyses (IDA) for the National Commission on the Structure of the Air Force, which was established by the National Defense Authorization Act for Fiscal Year 2013. Each analysis addresses an issue raised by the Commission staff regarding possible changes to the use of Air Reserve Component (ARC) forces that could enhance the overall efficiency of the Air Force. Detailed papers on each issue follow this executive summary. Below we have the issues and a very brief summary of our analysis.

> ***What are the feasibility and cost implications of maintaining desired ARC strength levels with an ARC that is expected to be voluntarily activated one-sixth of the time?*** We found that moving to a one-sixth activation policy would reduce accessions to some extent—not everyone prefers more activation—but those who joined would be more likely to remain in the force. Therefore, we believe strength targets would be met.
>
> ***What are the cost implications of having a more Reserve-intensive F-16 force?*** We examined alternative ways to provide the same number of aircraft available for deployed rotations. We found in general that a more Reserve-intensive F-16 force offered the same deployment capability for roughly the same cost as a more Active-intensive force but offered greater strategic reserve.
>
> ***What are the cost and availability implications of placing some Security Force assets in the ARC?*** We found that, over a considerable range of assumptions, a more ARC-intensive security force could meet potential deployment requirements and provide greater surge capability at a lower cost than a more Active-intensive security force.
>
> ***What are the cost implications of using more ARC pilots to provide initial pilot training?*** We found that increased reliance on the ARC to provide instructor pilots can potentially save about $1.3 million per instructor billet (annually) in the short run and $2.8 million per instructor billet in the long run, because of the reduced requirement for training new Active Duty fighter pilots and the reduced requirement for retraining Active instructor pilots returning to operational billets on fighter platforms.

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1. Sustaining a 1:5 Activation Rate in the Air Reserve Components: Results from the Reserve Component Simulation Model

Colin M. Doyle and Steven B. Walser

A. Introduction

The National Commission on the Structure of the Air Force requested that the Institute for Defense Analyses (IDA) perform an investigation of the feasibility of increasing the Active Duty-to-Dwell time ratio for members of the Air Reserve Component (ARC) from 1:9 to 1:5 and sustaining that ratio indefinitely. A ratio of 1:5 implies that ARC personnel spend five times more of their career inactive than they spend on Active Duty. The question of whether such a change is feasible depends crucially on whether the ARC can continue to recruit and retain sufficient personnel when those personnel are utilized at the higher rate. IDA's existing Reserve Component Simulation Model (R-SIM) was developed to address these kinds of questions. This chapter reports the results of the IDA research team's use of R-SIM to provide insights into the issue raised by the Commission.

B. The Reserve Component Simulation Model

The R-SIM forecasts accession and continuation rates for a Reserve Component (RC) by modeling the behavior over time of those young people who are eligible to join the RC. Young civilians decide in each year whether to join the Selected Reserve. Reservists and Guard members decide in each year whether to stay or leave the Selected Reserve. They make these decisions by comparing the benefits of leaving in the current year with the benefits of staying. They also consider what their benefits will be in future years as well as in the present.

In the R-SIM, three factors affect members' decisions to join, and to stay in, the RC. First, they value money income. Their benefit from being in the Selected Reserve includes the military income that they earn when not on Active Duty, as well as the difference between the military income that they earn on Active Duty and the civilian income they would otherwise have earned. Second, they care about the amount of time they spend on Active Duty, and assign a positive or negative valuation to a day on Active Duty. Third, random events also affect their decisions; for example, a spousal illness may raise the "cost" of service temporarily. These random "shocks" are added to income and the valuation of Active Duty, giving a total measure of *utility*—the Reservist's well-being. A Reservist decides whether to stay or leave the RC by comparing the sums of the discounted expected values of present and future utility generated by staying or leaving. IDA also recognizes that members are motivated by a sense of duty; this may be partly captured in the taste for service calculation, but we cannot fully account for this important intangible factor.

The relationship between Active Duty time and the Reservists' utility (their well-being) has two important features. First, the relationship is non-linear: a Service member who would prefer six months of Active Duty to no Active Duty this year might also prefer no Active Duty to eighteen months. Second, Reservists' past history of time spent on Active Duty affects the decisions they make today. A reservist's valuation of Active Duty time for his current utility includes both the number of months on Active Duty this year and the number of months in prior years.

The key feature of the model is that the relationship between Active Duty and utility can be different for each person. The model assumes that the individuals' attitudes follow a statistical distribution along the axis from Active Duty being more beneficial to Active Duty being more costly. Some individuals may prefer no Active Duty, while others may prefer to have some Active Duty but not too much time away from home; still others may prefer to be full-time on Active Duty. Figure 1 presents an illustration of such a distribution. Other parameters estimated in the model capture the importance of compensation, the non-linear effects of Active Duty time, and the role of random shocks.

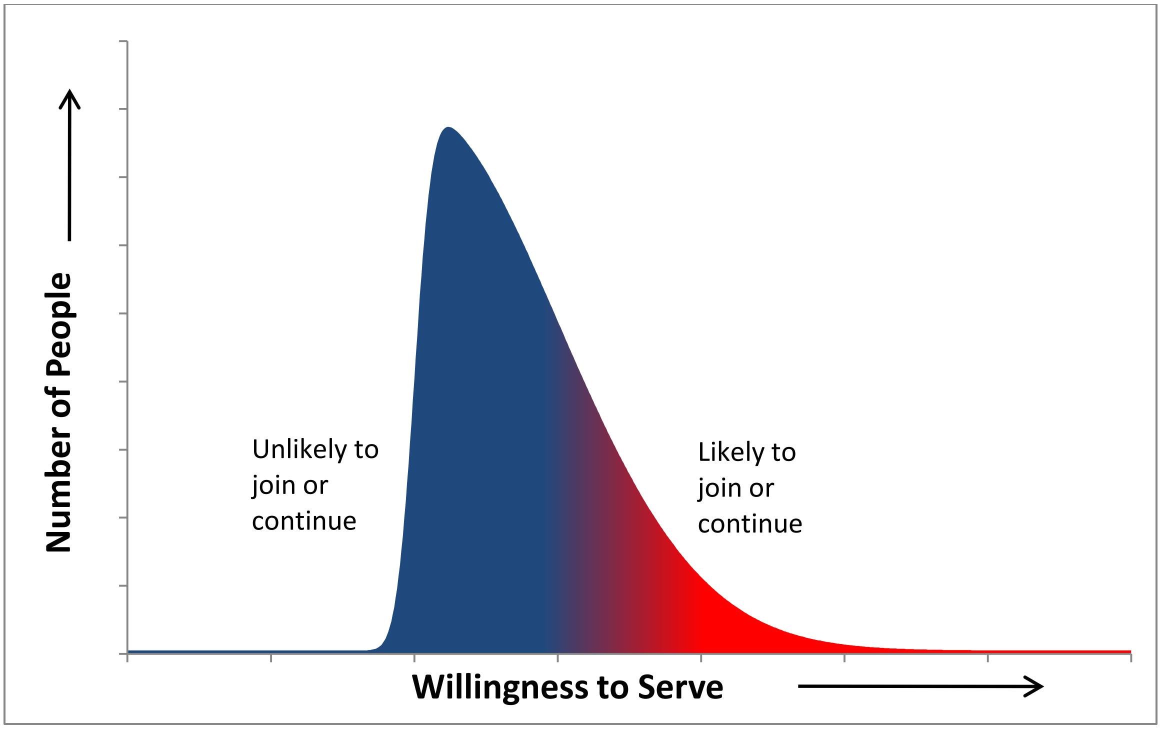

Figure 1. Illustrative Distribution of Preference for Active Duty in the RC

The R-SIM predicts joining and continuation rates by drawing many thousands of simulated young civilians randomly from the population distribution. Each individual is given a random history of activation based on their commitment, and then makes joining and staying decisions based on their parameters and the amount of Active Duty they receive. Aggregating all of these choices provides the joining and staying rates for the RC as a whole.

The specific parameters of the model used in our predictions are those that best matched the actual accession and continuation rates of the period FY00–FY06. A full description of the R-SIM calibration method is presented in "Tailoring Active Duty Commitments for Reserve Component Service Members" (Graham et al. 2011).

C. Results

We will present R-SIM results for the ARC prior service population; that is, those who joined the ARC after serving in the Active Duty Air Force. Our previous work with R-SIM suggests that results would not be qualitatively different for the non-prior service population. We compare the hypothetical policy of an indefinite 1:5 rotation rate with (1) the R-SIM baseline, in which rotation rates are 1:9 during periods of war and 1:11 during periods of peace; and (2) a hypothetical case of an indefinite 1:9 rotation. All results are for the steady-state case; that is, they are the condition of the force that would prevail after several years of the alternative policy.

1. Recruiting

The results for recruiting are presented in Table 1. Increasing the rotational demand on ARC members reduces recruiting significantly because many potential recruits with a low taste for Active Duty are dissuaded from joining. The ARC will draw fewer recruits from the left side of the distribution in Figure 1. Importantly, accessions of members with a high preference for Active Duty (those on the right side of the distribution) will increase—these individuals will be attracted by the opportunity to serve. However, the decline among the "low taste" group dominates and the overall recruiting numbers fall.

Table 1. Recruiting Results

Rotation	Recruiting (Relative to R-SIM Baseline)
R-SIM Baseline (OEF/OIF)	100%
1:9 Indefinitely	72%
1:5 Indefinitely	64%

2. Strength and Retention

Table 2 presents results for the total strength of the ARC. The total strength of the force has not been reduced to the extent that might have been expected from the decline in recruits. In fact, strength is actually higher in the 1:5 case than in the baseline case. This counter-intuitive finding is the result of the behavior of the "high taste" individuals. This group increases their retention when offered greater opportunities to serve. Additionally, as noted, more members of this group choose to join. Consequently, the force will now be composed of those with a high willingness to serve. The resulting high retention rates increase the size of the force.

Table 2. Results for Total Strength of ARC

Rotation	Strength (Relative to R-SIM Baseline)
R-SIM Baseline (OEF/OIF)	100%
1:9 Indefinitely	92%
1:5 Indefinitely	109%

3. Increasing Pay

The negative effects of increasing the rotation rate on recruiting can be alleviated by increasing pay. Table 3 reproduces the recruiting results from Table 1 when total pay is increased by $10,000 per year for all years of service. Strength now increases relative to the baseline in both alternative cases.

Table 3. Recruiting Results Assuming a Total Pay Increase of $10K per Year

Rotation	Recruiting (Relative to R-SIM Baseline)
R-SIM Baseline (OEF/OIF)	100%
1:9 Indefinitely with $10,000/year Extra Pay	105%
1:5 Indefinitely with $10,000/year Extra Pay	75%

4. Commitment Choices

A potential alternative to increasing the rotation rate across the board is to offer alternative contract options to recruits, allowing them to self-select into higher or lower rotation units/careers. R-SIM has the capability to forecast the results of such policies. IDA considered an alternative to the 1:5 case in which recruits are offered the choice to sign up for 1:6 or for 1:4 up front. Table 4 presents the R-SIM results, which demonstrate that the presence of "high taste" individuals in the population ensures that significant numbers of recruits would voluntarily choose a commitment *in excess of* 1:5.

Table 4. Forecasted Results for Alternative Contract Options

	1:6 Contract	1:4 Contract	Total
% of Recruits	24%	76%	100%
% of Total Strength	9%	91%	100%

5. Unfulfilled Expectations

The prior examples are of steady state cases in which the Active Duty expectations of recruits are met. We also considered a disequilibrium case in which a force recruited during a period of 1:5 activation is unexpectedly switched to 1:9 activation. The force profile evolves over several years from the 1:5 steady state case to the 1:9 steady state case. During the transition recruiting increases and continuation falls. Strength is increased above the 1:5 steady state level initially as the force is buoyed by a surge in new recruits, but the decline in retention drives a longer term decline in strength. Figure 2 plots the trend in strength; the new rotation is instituted in Year 2.

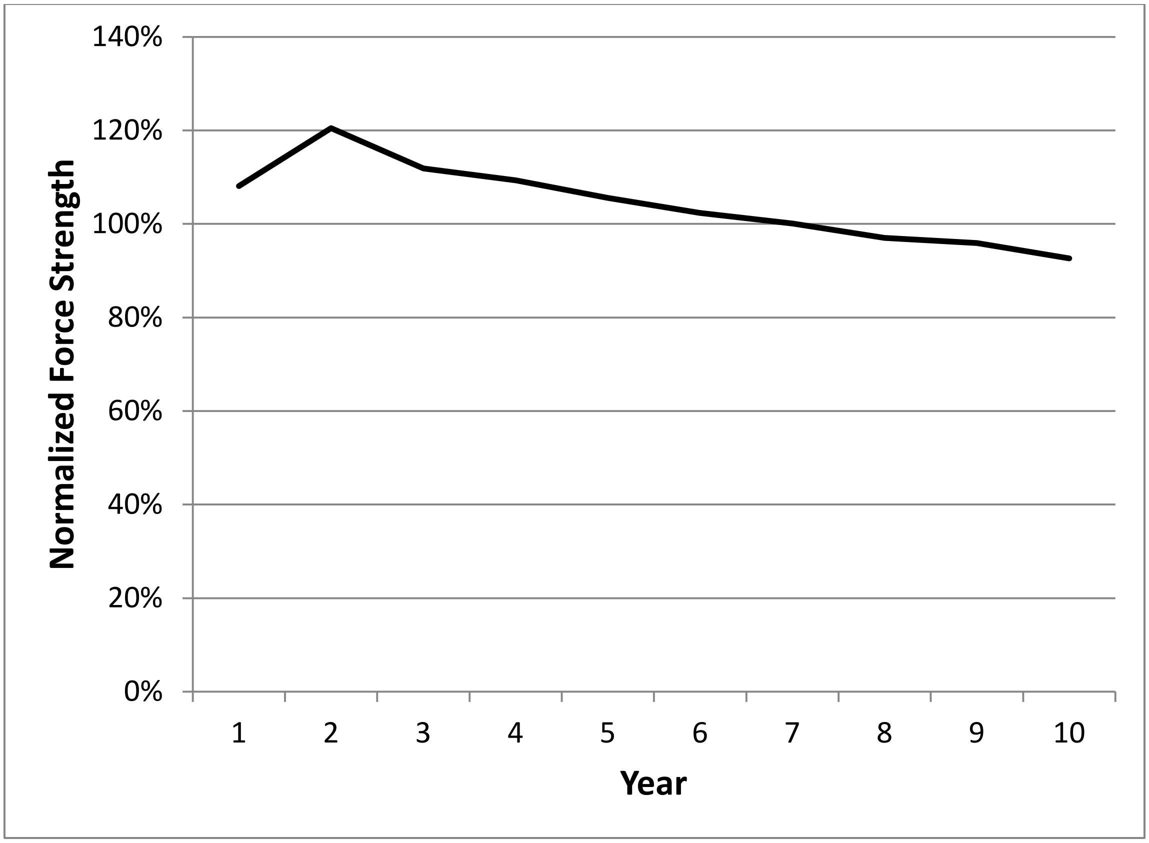

Figure 2. Trend in Force Strength When Expectation of Frequent Activation is Not Met

D. Conclusions

Analyses utilizing IDA's R-SIM model provide evidence that an indefinite 1:5 rotation rate may well be sustainable for the ARC. Although recruiting would likely suffer, increased retention combined with a shift in the recruit population to those with a greater preference for active service would allow the ARC to maintain their current strength. Pays and commitment choices would provide the ARC with additional tools to manage the effects of higher personnel tempo. If people are recruited with the expectation of frequent activation, less frequent use will inhibit retention and threaten the ability to meet desired strength levels.

2. Air Force F-16 Analysis

Shaun K. McGee

A. Introduction

This chapter addresses the cost of Air Force F-16 aircraft squadrons. Units are modeled using Air Force-sourced cost factors as described in Section B.

Characteristics of the analysis include:

- Costs for baseline squadrons that train at normal historical rates and do not deploy; costs for a rotational force under limited alternative resourcing scenarios
- AC squadron size of 24 aircraft, RC squadron size of 24 aircraft, and National Guard Component squadron size of 21 aircraft
- AC Boots on the Ground (BOG)-to-Dwell ratios of 1:2, 1:3; RC BOG-to-Dwell ratios of 1:5, 1:7
- Deployments of 120 days for both AC and RC with adjustments for higher pilot rotational rates of up to 30 days
- Deployed aircraft operate at an operating tempo of approximately three times the normal peacetime operating tempo for AC aircraft (3x normal AC peacetime flying hours)

B. Data Sources

Table 5 contains the data sources used in this analysis.

Table 5. Primary Air Force Flying Unit Data Sources

Category	Source
Personnel	Office of the Secretary of Defense (Air Force)
Equipment Operations and Maintenance	AFI 65-503 AFI 11-2
Procurement	AFEMS (*excluded for Commission analysis*)
Indirect	AFI 65-503 Future Years Defense Program (Air Force) (FYDP)
Deployment	IDA Contingency Operations Support Tool (Air Force) Air Force Total Ownership Cost (AFTOC)

C. Results

The results in this section are based initially on the assumptions described previously. Initial results are provided as a report of typical squadron costs by Component according to historical flying hour rates (variable by command and Component) and resourcing levels (Table 6). There are no rotation or deployment assumptions applied to these results, and no Associate squadrons are included.

Table 6. Air Force F-16 Squadron Annual Costs and Strategic Potential

	ACC	USAFE	PACAF	AFR	ANG
Program Factors					
Primary Aircraft Authorization (PAA)	24	24	24	24	21
Flying Hours (FH) / PAA / Year	312	336	280	233	180
Cost Element					
Unit-Level Manpower	53.1	73.8	76.8	52.2	35.9
Unit Operations	35.6	38.4	32.0	26.6	18.0
Maintenance	46.3	49.7	41.7	34.9	23.9
Sustaining Support	6.9	7.0	7.0	2.4	2.2
Continuing System Improvements	9.4	9.4	9.4	9.4	8.2
Indirect Support	26.5	42.0	40.1	9.6	32.2
Total ($M)	**177.8**	**220.4**	**207.0**	**135.2**	**120.4**
$M / PAA / Year	7.41	9.18	8.63	5.63	5.74
$M / PAA / Year *(21 PAA)*	*7.84*	*9.83*	*9.28*	*6.00*	*5.74*
$K / FH	23.8	27.3	30.8	24.2	31.9
$K / FH (300 FH / PAA / Year)	*24.3*	*29.3*	*29.5*	*21.2*	*23.4*

Notes: ACC = Air Combat Command; USAFE = US Air Forces Europe; PACAF = Pacific Air Forces; AFR = Air Force Reserve; ANG = Air National Guard.

Table 7 through Table 11 provide some initial cost results for notional force structures for the F-16 community within the Air Force. Rather than presenting graphical output, initial results are provided in tabular form in anticipation of further analysis. Both inventory and cost is presented.

The baseline demand of 1:2 and 1:5 is considered in Table 7 through Table 9.

Table 7. Squadron Costs and Deployable Potential (1:2 / 1:5)

Baseline 525 Tails at 1:2 / 1:5							
Inventory (PAA)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**PAA**	
Rotating	85	45	45	150	150	475	
Fenced	0	25	25	0	0	50	
Strategic	0	0	0	0	0	0	**Rotation**
PAA	**85**	**70**	**70**	**150**	**150**	**525**	**108**
		AC 225		RC 300			
Annual Cost ($M)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**Total**	
Rotating	869	513	496	1,100	1,113	4,091	
Fenced	0	230	216	0	0	445	
Strategic	0	0	0	0	0	0	
Total	**869**	**742**	**712**	**1,100**	**1,113**	**4,536**	

Table 8. Squadron Costs and Deployable Potential (1:2 / 1:5 Shift to RC)

535 Tails at 1:2 / 1:5 Shift to RC							
Inventory (PAA)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**PAA**	
Rotating	85	29	29	180	180	503	
Fenced	0	16	16	0	0	32	
Strategic	0	0	0	0	0	0	**Rotation**
PAA	**85**	**45**	**45**	**180**	**180**	**535**	**108**
		AC 175		RC 360			
Annual Cost ($M)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**Total**	
Rotating	869	331	320	1,320	1,336	4,174	
Fenced	0	147	138	0	0	285	
Strategic	0	0	0	0	0	0	
Total	**869**	**477**	**458**	**1,320**	**1,336**	**4,459**	

Table 9. Squadron Costs and Deployable Potential (1:2 / 1:5 Shift to RC with 65% Res.)

535 Tails at 1:2 / 1:5 Shift to RC with 65% Resourcing							
Inventory (PAA)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**PAA**	
Rotating	85	29	29	180	180	503	
Fenced	0	16	16	0	0	32	
Strategic	0	0	0	0	0	0	**Rotation**
PAA	**85**	**45**	**45**	**180**	**180**	**535**	**108**
		AC 175		RC 360			
Annual Cost ($M)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**Total**	
Rotating	869	331	320	1,093	1,158	3,770	
Fenced	0	147	138	0	0	285	
Strategic	0	0	0	0	0	0	
Total	**869**	**477**	**458**	**1,093**	**1,158**	**4,055**	

The demand of 1:3 and 1:7 is considered in Table 10 and Table 11.

Table 10. Squadron Costs and Deployable Potential (1:3 / 1:7)

Baseline 525 Tails at 1:3 / 1:7							
Inventory (PAA)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**PAA**	
Rotating	85	45	45	150	150	475	
Fenced	0	25	25	0	0	50	
Strategic	0	0	0	0	0	0	**Rotation**
PAA	**85**	**70**	**70**	**150**	**150**	**525**	**81**
		AC 225		RC 300			
Annual Cost ($M)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**Total**	
Rotating	809	488	469	1,036	1,050	3,852	
Fenced	0	230	216	0	0	445	
Strategic	0	0	0	0	0	0	
Total	**809**	**717**	**685**	**1,036**	**1,050**	**4,297**	

Table 11. Squadron Costs and Deployable Potential (1:3 / 1:7 with 108 Rotational)

685 Tails at 1:3 / 1:7 with 108 Rotational Tails							
Inventory (PAA)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**PAA**	
Rotating	135	45	45	205	205	635	
Fenced	0	25	25	0	0	50	
Strategic	0	0	0	0	0	0	**Rotation**
PAA	**135**	**70**	**70**	**205**	**205**	**685**	**108**
		AC 275		RC 410			
Annual Cost ($M)	**ACC**	**AFE**	**PACAF**	**AFR**	**ANG**	**Total**	
Rotating	1,285	488	469	1,416	1,435	5,093	
Fenced	0	230	216	0	0	445	
Strategic	0	0	0	0	0	0	
Total	**1,285**	**717**	**685**	**1,416**	**1,435**	**5,538**	

3. Air Force Security Forces Analysis

Shaun K. McGee

A. Introduction

This chapter addresses the cost of Air Force Security Forces units as well as the ability of the units to provide deployed presence on a rotational basis. Units are modeled using both Air Force and Army-sourced cost factors as described in Section B. We had to use Army factors for unit operating and procurement costs because we do not currently have access to Air Force information at the unit level.

The purpose of the analysis is to understand the extent to which Security Forces in the RC (specifically the National Guard) could perform required deployed functions at a lower cost than Security Forces in the AC. The analysis assumes that home station functions could be performed by a more RC-intensive mix of Security Force units.

Both Active and National Guard Security Force units are assumed to be available to rotate for deployed operation periodically. Our treatment assumes that sometimes available units will be called upon to deploy and sometimes they will not. It is also assumed that National Guard units undergo a month of training after mobilization before they deploy.

Characteristics of the analysis include:

- Costs for units that train but do not deploy and costs for units that train and deploy when available are noted separately as *deployable* and *deploying*
- AC BOG-to-Dwell ratios of 1:1, 1:3, and 1:5; National Guard Component Mobilized (MOB)-to-Dwell ratios of 1:3, 1:5, and 1:7
- Deployments of 120 days for both Components with 30 day pre-deployment mobilization and training periods for the National Guard Component
- Deployed airmen operate at an operating tempo of three times normal peacetime operating tempo for ANG
- Resourcing at variable levels with lower levels during unavailable periods and higher levels during available and deployed periods

B. Data Sources

Data sources used are listed in Table 12.

Table 12. Primary Air Force Land Force Data Sources

Category	Source
Personnel	Office of the Secretary of Defense (Air Force)
Equipment Operations and Maintenance	Army Cost & Economics (Army)
Procurement	Army Cost & Economics (Army)
Indirect	Future Year Defense Program (Air Force)
Deployment	IDA Contingency Operations Support Tool (Air Force)

C. Results

This section provides a set of outputs based on previously discussed and additional assumptions. We have selected a representative unit for the analysis: an Army Military Police Battalion including 170 soldiers (airmen). This unit is roughly comparable to the Air Force Security Forces Unit Type Code (UTC) Base Defense Squadron, which had 200 personnel. Table 13 provides a cost on a per-airman basis along with average potential deployable output for three sets of BOG- or MOB-to-Dwell ratios. Deploying airmen include the annual average cost of deployments in the annual average cost of an airman. For example, for airmen who deploy every fourth year, 25 percent of personnel and other costs associated with deployment enter the average annual costs.

Table 13. Notional Air Force Airman Costs and Deployable Potential

Annual Average Cost for an SFS	Active Component			National Guard Component		
1:1 / 1:3	**Cost**	**Max BOG**	**BOG**	**Cost**	**Max BOG**	**BOG**
Deployable Airman	138,000	0.50	0.00	40,000	0.20	0.00
Deploying Airman	289,000	0.50	0.50	119,000	0.20	0.20
1:3 / 1:5						
Deployable Airman	132,000	0.25	0.00	37,000	0.13	0.00
Deploying Airman	207,000	0.25	0.25	89,000	0.13	0.13
1:5 / 1:7						
Deployable Airman	129,000	0.17	0.00	33,000	0.10	0.00
Deploying Airman	179,000	0.17	0.17	73,000	0.10	0.10

Note: SFS = Security Forces Squadron.

Figure 3 presents results in an alternative way. Wide ranges of force structures and deployment requirements are depicted. The red dot characterizes a force structure of 60 units that is composed of half Active and half National Guard units. The BOG-to-Dwell ratio is 1:3 for the Active units and the MOB-to-Dwell ratio is 1:5 for the National Guard units. In addition, the National Guard units are assumed to be mobilized one month before deployment for additional training. It is assumed that half of the units that become available for deployment will actually be called on to deploy. Under these circumstances, the 60 units cost $1.5 billion per year and could generate 15 units of BOG on a continuing basis, although only half that much is called for.

The blue outline around the red dot depicts the range of possible costs and rotational presence outputs associated with force structures of 60 units. The upper left corner of the blue outline represents an all-National Guard force that is always called upon to deploy when available. The upper right corner represents an all-Active force that always deploys when available. The lower left corner represents an all-National Guard force that is never called upon to deploy and the lower right corner represents an all-Active force that is never called upon to deploy. The slopes of the upper and lower sides of the figure reflect the relative cost of Active and National Guard units under different assumptions about the need to deploy when available. The height of the figure reflects the additional cost associated with deployments.

The orange and green figures represent smaller (40 unit) and larger (120 unit) force structures operating under the 1:3/1:5 scenarios.

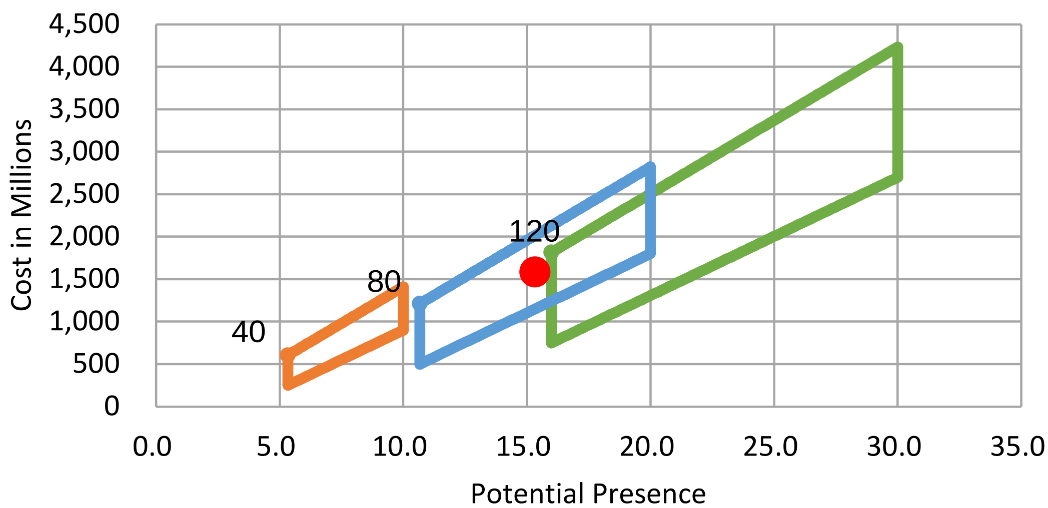

Figure 3. 40, 80, and 120 Unit Force Structure Cost and Potential Presence

As is obvious in Figure 3, increasing the percentage of AC units—moving to the right in the each region—increases costs while increasing operational presence. Within each region, force size remains the same. Comparing the green and blue regions shows that it is possible to provide a given amount of presence at a lower cost with a more National Guard-intensive mix of Security Force units. This result is not uncommon for units with limited equipment and training requirements.

4. Increasing the Use of Reserve Component Instructors to Provide Initial Pilot Training

Stanley A. Horowitz, Nancy M. V. Huff, and Shaun K. McGee

A. Introduction and Overview

Most initial pilot training is now provided by Active Duty instructors. Active pilots assigned to instructor positions must be replaced in the operational force. Their replacements must (over the long run) be recruited, trained, and compensated. In addition, after a three-year tour as instructors, these pilots must go through a retraining program to allow them to return to operational billets.

This chapter considers the possibility of replacing some Active instructor pilots with prior-service volunteers from the ARC. In the case being examined, ARC personnel would be permanently assigned to instructor duty. Their former billets would be filled by increasing the number of ARC pilots. Since ARC pilots generally receive pilot training when they join the active force, increasing the number of ARC pilots would not increase aggregate pilot training costs. It is expected that ARC instructor pilots would not rotate back to operational squadrons and would, thus, not incur retraining costs. In this analysis, we focus specifically on pilots in the fighter track, where training costs are the most substantial.[1]

The analysis that follows focuses on the cost implications of replacing a single active instructor pilot with ARC pilots. More than one ARC pilot is required to fill a full-time instructor billet because ARC pilots can provide fewer days of service per year. The analysis abstracts from the specifics of implementation. assuming that ARC volunteers will be available for instructor pilot duty and that the geographic specificity of the duty will not be a constraint on this availability.

We find that increased reliance on the ARC to provide instructor pilots can potentially save about $1.3 million per instructor billet in the short run and $2.8 million per instructor billet in the long run, because of the reduced requirement for training new Active Duty fighter pilots and the reduced requirement for retraining Active instructor

[1] Our estimated cost savings would be lower for the cargo track since the training costs for cargo pilots is much lower, but the mechanisms that would drive cost savings from increasing the use of ARC cargo pilots as instructors would be unchanged.

pilots returning to operational billets on fighter platforms. The magnitude of the savings is principally determined by the size of these training costs.

B. Model Description

1. Initial Assumptions

Established fighter pilots—those who have completed platform-specific training—can spend their flying time providing non-instructional operational hours,[2] training to maintain proficiency (*proficiency training*), or providing instruction to train new pilots (*instructor training*). We assume that operational flying hours and instructor training days can substitute for all but two of any single pilot's flight days per year.

We assume the representative career trajectory of an Air Force fighter pilot begins in the AC with general pilot training and ends with training on a specific fighter platform such as an F-16. After a pilot completes this training, he is assigned to fly operational sorties for a few years. At some point, AC pilots may be required to spend three years serving as instructors for new pilots, during which time they maintain basic flying skills but lose their proficiency ratings in the fighter platforms. After the three-year instructor duty is completed, these pilots must then be retrained on the fighter platforms before returning to operational duties. At the end of his Active Duty career, a pilot may either join the ARC or exit military service. Pilots in the ARC may be assigned to provide either operational hours or instructor training for new pilots. We assume that once an ARC pilot becomes an instructor, he does not return to operational activities (so there is no need for retraining ARC pilots). We assume the turnover rate of Active Duty pilots is 10 percent. That is, to maintain the stock of active pilots, one new pilot must be trained every year for every ten pilots already in the force.

Because we are only interested in changing the AC-RC mix of the instructional pilot force in this exercise, we hold total operational requirements constant so that we can focus specifically on the part of the Active and Reserve pilot force that is providing instructor training. Instructor pilots in the AC are assumed to produce 200 flight days per year, of which two must be spent solely on maintaining proficiency. ARC instructor pilots are assumed to produce only 60 flight days per year, but, like AC pilots, must spend two of those days solely on maintaining proficiency. Hence, AC pilots provide 198 instructions days per year, and ARC pilots provide 58 instruction days per year.[3]

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2 For convenience, we use the word "operational" in this paper to describe to activities that are not related to instructing new pilots.

3 The cost impact of increasing the number of ARC annual flight days per pilot is minimal.

2. Estimating the Savings from Using More ARC Pilots as Instructors

To explore the cost implications of shifting instructor training duties to the ARC, assume that one 198-day AC instructor-training billet is eliminated and replaced with the equivalent number of RC billets required to complete the 198-day instructor training requirements. That is, since each RC pilot can provide 58 instructor-training days, $198/58 = 3.41$ ARC billets are created. To estimate the resulting change in costs, we must calculate the savings from reducing the stock of AC pilots by 1 and the expenses that result from increasing the stock of ARC pilots by 3.41.

On the AC side, eliminating the instructor billet saves the Air Force all of the costs associated with that pilot, including initial training, retraining, and compensation. Table 14 summarizes the training and salary costs associated with a single Active instructor pilot. In the first panel, we examine the potential short-run savings from eliminating an AC instructor billet, the bulk of which are from reduced training requirements. The short-run cost associated with training a new pilot is $3.6 million and our assumed turnover rate is 10 percent, so eliminating the Active Duty instructor billet saves about $360,000 in new pilot training every year. Likewise, since Active pilots are assumed to spend three years as instructors, one third of these instructors are being retrained to return to operational duty each year. By eliminating an Active instructor billet, we also reduce this annual retraining cost by $904,000. The AC also saves the cost of paying the Active Duty pilot an average annual salary of $152,000. In total, the short-run savings to the AC by eliminating an instructor billet is about $1.4 million annually.

Table 14. Cost Savings (in Thousands) to the AC of Eliminating a Single AC Instructor Pilot

Short-Run Costs ($K)	
New fighter pilot training cost per pilot (variable)	$3,602
Annual new fighter pilot replacement rate	10%
Fighter platform retraining course cost (variable)	$2,712
Annual fighter platform retraining rate	33%
Annual compensation cost	$152
Annual savings from reduced training requirements	$(3602 \times 0.1) + (2712 \times 0.33) = \$1{,}255$
Total AC Savings	**1255 + 152 = $1,407**
Long-Run Costs ($K)	
New fighter pilot training cost per pilot (fixed + variable)	$7,499
Annual new fighter pilot replacement rate	10%
Fighter platform retraining course cost (fixed + variable)	$6,036
Annual fighter platform retraining rate	33%
Annual compensation cost	$152
Annual savings from reduced training requirements	$(7499 \times 0.1) + (6036 \times 0.33) = \$2{,}742$
Total AC Savings	**2742 + 152 = $2,894**

Note: Training Costs are from AFI 65-503. Annual AC pilot compensation is from the IDA Air Force cost model.

If many instructor billets are shifted to the ARC, in the long run it is possible that many fixed costs associated with pilot training (e.g., facility costs) will also be reduced. The second panel of Table 14 shows that the total potential long-run cost savings to the AC in this case are about $2.9 million per instructor billet that is eliminated.

On the RC side, 3.41 ARC billets must be created to fill the 198 instruction hour deficit.[4] Since prior-service ARC pilots have already completed initial-pilot training, adding these instructor billets does not increase ARC's burden to train new pilots. Likewise, since we assume ARC instructor pilots do not return to fighter pilot duty, these billets do not have any associated retraining costs. As a result, the only expense associated with these billets is the cost of compensating additional pilots.[5] With an annual

4 In fact, since fewer AC pilots are being trained, the total number of required instruction hours may fall. If so, fewer RC instructor hours would be required to fill the eliminated AC billets, although this effect would only have a small positive impact on the total cost savings given how small the ARC expenses are relative to the reduction in AC training costs.

5 In this paper, we do not directly address the costs of recruiting the additional ARC pilots or the possibility that there may be some relocation expenses related to ARC pilots who may have to provide instruction away from their home station. We anticipate that these costs would be small relative to the savings from reducing AC training.

compensation cost of about $41,000 per ARC pilot, the total increased expense to the ARC from the additional billets is about $139,000.[6]

In summary, we estimate that the Air Force can potentially save about $1.3 million per instructor billet in the short run and $2.8 million per instructor billet in the long run by increasing the use of reserve component instructors to provide initial pilot training. The bulk of these savings arise out of reductions to the training requirements for the Active Duty force.

3. Examining the Potential Cost Savings from an Alternative Career Trajectory

In the analysis above, we assume that Active fighter pilots are fully trained on a fighter platform before beginning service as instructor pilots. In this section, we examine the cost effectiveness of shifting instruction to ARC pilots in a case where AC pilots are not trained on a fighter platform until *after* they have served as instructor pilots. (They still complete general pilot training before becoming general pilot instructors.)

In this case, the opportunity cost of a year of service as an AC instructor pilot is still a year of service as a fighter pilot. Equivalently, a fully qualified fighter pilot must be trained to replace the instructor pilot while he is unavailable to fill operational billets. Hence, eliminating an Active Duty instructor billet still saves $360,000 per year in the short run and $750,000 per year in the long run in new pilot training expenses.[7] However, because instructor pilots do not receive type training until after they complete their service as instructors, the duplication of type training is eliminated, so shifting an AC instructor billet to the ARC no longer saves retraining expenses. After adding in the compensation savings, the total savings to the AC of eliminating an instructor billet is now $512,000 in the short run and $902,000 in the long run.

RC expenses from increasing the stock of ARC instructor pilots are unchanged. Combining the savings to the AC with the increased costs of the RC, the total savings from substituting ARC instructor pilots for AC instructor pilots are now $372,000 per eliminated AC billet in the short run and $762,000 per AC billet in the long run.[8] The cost savings from using ARC pilots are much lower now because the inefficiency that resulted from sending AC fighter pilots through platform-specific training twice has already been eliminated. However, the savings are still positive because using ARC pilots

6 ARC pilot compensation cost is derived from the IDA Air Force cost model.

7 That is, the full cost of training a fighter pilot times the 10 percent annual replacement rate.

8 These cost savings reflect the effect of substituting ARC instructors for AC instructors given that AC fighter pilots now wait to do type training until after serving as instructors. The following formula shows how to calculate the annual savings of a change in AC policy from type training before and after instructor duty to only after instructor duty:

$$\frac{\textit{platform-specific retraining costs} \times \textit{number of AC instructor pilots}}{\textit{years each pilot spends as an instructor}}$$

as instructors eliminates the opportunity cost of assigning a pilot who would otherwise be flying fighters to non-fighter activities.

Appendix A.
Reference

Graham, David R., Colin M. Doyle, Joseph F. Adams, Robert J. Atwell, Ayeh Bandeh-Ahmadi, John R. Brinkerhoff, William R. Burns, Hansford T. Johnson, Yevgeniy Kirpichevsky, Drew Miller, Timothy Ni, Michael F. Niles, and Steven B. Walser. 2011. "Tailoring Active Duty Commitments for Reserve Component Service Members." IDA Paper NS P-4751. Alexandria, VA: Institute for Defense Analyses.

Appendix B.
Abbreviations

AC	Active Component
ACC	Air Combat Command
AFI	Air Force Instruction
AFR	Air Force Reserve
AFTOC	Air Force Total Ownership Cost
ANG	Air National Guard
ARC	Air Reserve Components
BOG	Boots on the Ground
FH	Flying Hours
FY	Fiscal Year
FYDP	Future Years Defense Program
IDA	Institute for Defense Analyses
MOB	Mobilized
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
PAA	Primary Aircraft Authorization
PACAF	Pacific Air Forces
R-SIM	Reserve Component Simulation Model
RC	Reserve Component
SFS	Security Forces Squadron
USAFE	US Air Forces Europe
UTC	Unit Type Code

REPORT DOCUMENTATION PAGE	*Form Approved* *OMB No. 0704-0188*

1. REPORT DATE *(DD-MM-YYYY)*: xx-04-2014

2. REPORT TYPE: Final

3. DATES COVERED *(From - To)*:

4. TITLE AND SUBTITLE

Analyses for the National Commission on the Structure of the Air Force (Revised)

5a. CONTRACT NUMBER: DASW01-04-C-0003

5b. GRANT NUMBER:

5c. PROGRAM ELEMENT NUMBER:

5d. PROJECT NUMBER:

5e. TASK NUMBER: AF-7-3752

5f. WORK UNIT NUMBER:

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8. PERFORMING ORGANIZATION REPORT NUMBER

IDA Document NS D-5130
H 14-000475

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

National Commission on Structure of the Air Force
2521 South Clarke Street, Suite 200
Arlington, VA 22202

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

Revised copy with corrections to Table 14, page 20.

14. ABSTRACT

This paper presents four short analyses performed by the Institute for Defense Analyses (IDA) for the National Commission on the Structure of the Air Force, which was established by the National Defense Authorization Act for Fiscal Year 2013. Each analysis addresses an issue raised by the Commission staff regarding possible changes to the use of Air Reserve Component (ARC) forces that could enhance the overall efficiency of the Air Force. Detailed papers on each issue follow this executive summary. The analyses address the following questions: What are the feasibility and cost implications of maintaining desired ARC strength levels with an ARC that is expected to be voluntarily activated one-sixth of the time? What are the cost implications of having a more Reserve-intensive F-16 force? What are the cost and availability implications of placing some Security Force assets in the ARC? What are the cost implications of using more ARC pilots to provide initial pilot training?

15. SUBJECT TERMS

Subject Terms: Air Force, force structure, reserve components, cost analysis, pilot training, reserve mobilization, security forces, F-16

16. SECURITY CLASSIFICATION OF: a. REPORT	b. ABSTRACT	c. THIS PAGE	17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
Unclassified	Unclassified	Unclassified	Same as Report	30	Taylor, Darryl

19b. TELEPHONE NUMBER *(Include area code)*: (703) 545-9113

Reset