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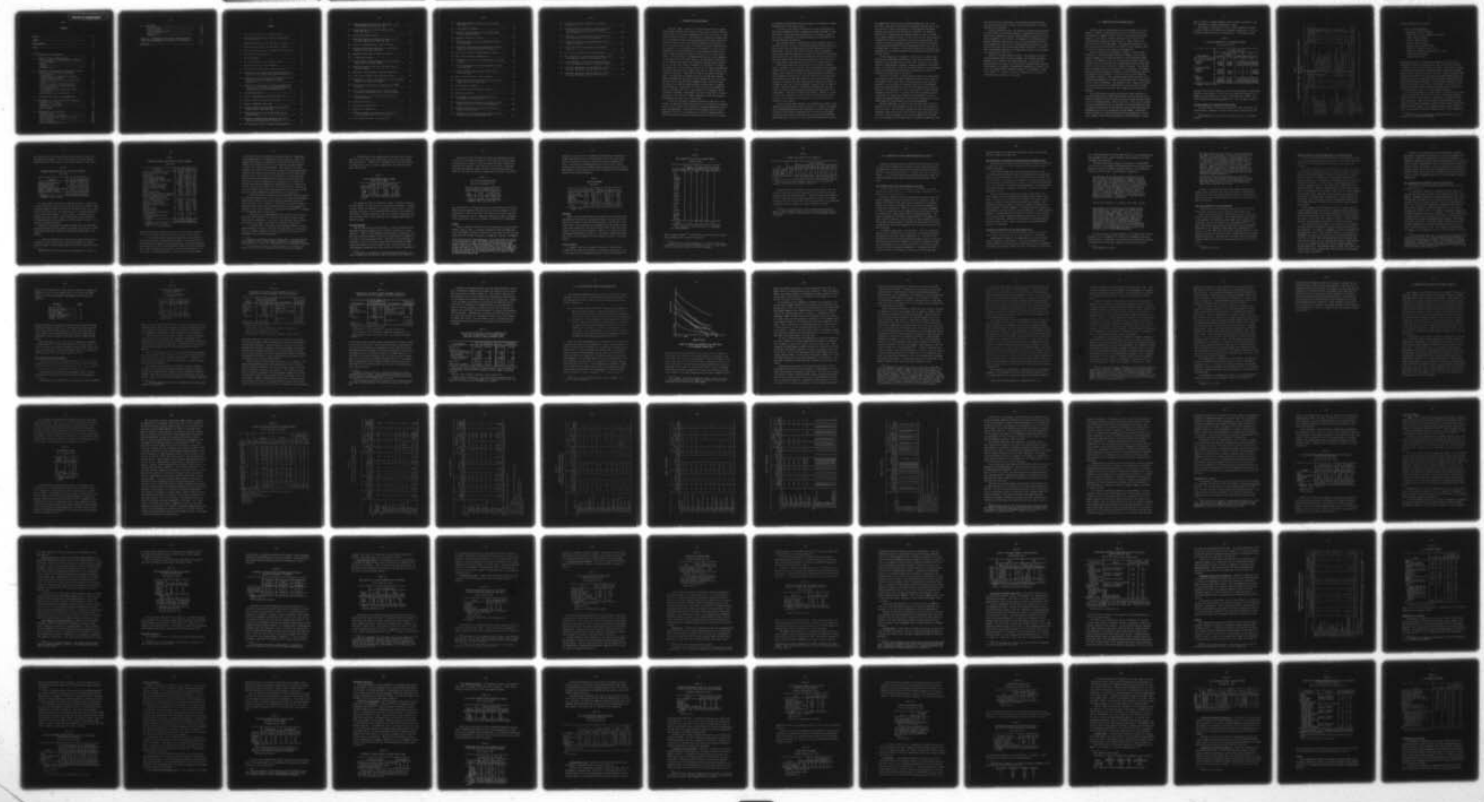

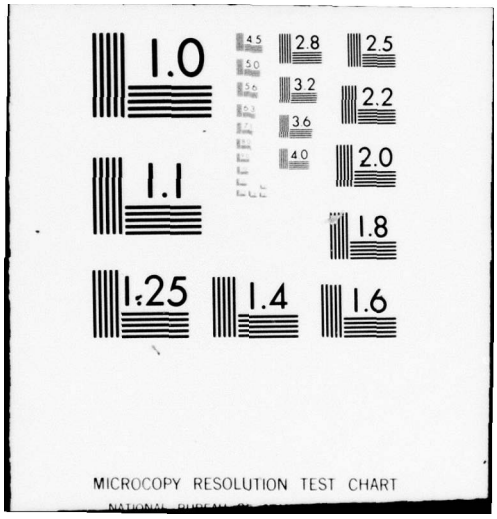
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R-1977/1-1-AF
September 1977

LEVEL II

The Air Reserve Forces in the Total Force: Vol. I Overview and Analytical Approach

F. J. Morgan, A. A. Barbour, R. M. Paulson,
C. B. East, C. B. Foch, B. M. Woodfill

A Project AIR FORCE report
prepared for the
United States Air Force

Rand
SANTA MONICA, CA. 90406

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(6) The Air Reserve Forces in the Total Force: Vol. I Overview and Analytical Approach

(Volume)

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PREFACE

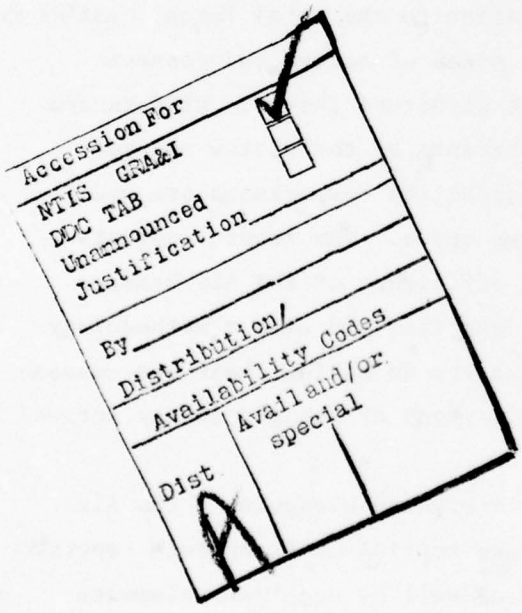
This report contains the results of research undertaken by The Rand Corporation in the fall of 1974 at the request of the Director of Plans, DCS/Plans and Operations, Headquarters United States Air Force. Rand was initially asked to "evaluate varying active/reserve force mixes in terms of total costs, capabilities, and responsiveness to and availability for peacetime/wartime requirements." During subsequent interactions with the Air Staff, it was jointly agreed to limit the scope of the study to increasing the understanding of Air Reserve Forces capabilities and costs, and to developing an improved methodology for examining alternative combinations of active and reserve forces, leaving the analysis of preferred alternatives to Air Staff planners. This agreement, although it delimited Rand's role, did not change the basic thrust of the research effort.

This volume and a companion volume on cost considerations (R-1977/2-AF) constitute the basic task report on the study of the current Air Reserve Forces and their relation to the total force. Although it does not present alternative force mixes of active and reserve units, it provides insights into force structure issues. Differences in the costs and other resource requirements of the active and reserve components are described, and capability comparisons are made of selected USAF and Air Reserve Forces units. The report suggests policy changes that could improve the efficiency of the Air Reserve Forces. More important, however, it describes and uses a methodology designed to assist force structure planners in making their own assessments of the cost and capability implications of changes in the active/reserve force mix.

During the course of the study, interested elements of the Air Staff were briefed on its progress. The initial draft of this report, completed in March 1976, was reviewed as well by cognizant elements of the Air Staff. That review plus normal Rand refereeing processes rendered some of the statistical material originally used in the report out of date. Data central to the analysis and conclusions were

updated; however, supporting data that remained relevant in terms of *proportional* values were left unchanged.

This report documents research conducted under Project AIR FORCE (formerly Project RAND) by The Rand Corporation. The work described in this report was performed under the project entitled "Total Force Options." The present volume--the final report of the study--is intended primarily for use by Air Staff elements concerned with force structure planning and force development. This work is an extension of Rand's study of a wide range of problems associated with the Air Reserve Forces. Earlier Rand research, from which the authors of the present volume drew liberally, included the 1967 *Air Reserve Study* (G. H. Fisher et al.) and the 1974 *Air Reserve Forces Personnel Study* (B. Rostker et al.).



SUMMARY

This report documents the research of a study which attempts to:

- Develop a comprehensive understanding of the military attributes and associated costs of Air Reserve Force (ARF) flying units, including an examination of the financial and operational impact of alternative organizational and managerial policies, and
- Develop an improved methodology to help Air Force planners and analysts derive preferred active/ARF mixes and select improved organizational and operational policies.

The research program designed to accomplish these objectives included visits to the headquarters of the reserve forces and to over 30 units of the Air National Guard (ANG) and Air Force Reserve (USAFR). The data collected and the insights gained permitted us to assess the ARF in relation to the total force. Beyond just developing a methodology for analyzing force structure modifications, we were able, by the force structure and cost data we analyzed and the operating mode information we evaluated, to provide insights into a wide range of organizational, force capability, management, and resource allocation topics. These we have grouped into the major sections of this report that deal with ARF manpower and organization, perceptions of the ARF held by USAF staff members, and the force structure, capability, and efficiency of the ARF in the total force context.

The major findings of this research project are summarized briefly in the paragraphs below.

On the basis of three case study comparisons of similarly equipped active and ARF units, plus general readiness statistics and information we obtained during our visits to a broad cross-section of ARF bases, we gained a strong impression that there would be no significant capability differences between comparably equipped active and ARF units *in the missions the ARF units are tasked to perform*. This qualifying phrase

is included because the mission requirements set down for ARF units typically fall short of the full mission designed operational capability (DOC) for the given aircraft. We believe that these DOC limitations may be overstated, however, to the extent that account is not taken of the ability of the highly experienced ARF crewmembers to maintain flying skills with fewer sorties than the standards authorize. A way to test these hypotheses on a more comprehensive cross-section of units than we were able to assess is provided in the report.

During the course of our extensive interviews with both USAF headquarters and field officers we heard some high praise of the ARF, particularly from officers who had been closely associated with them; however, we also encountered a rather persistent pattern of skepticism toward the ARF that if not corrected could tend to prejudice the assignment of additional missions. As a result of our detailed examination we conclude that many widely held perceptions are essentially without factual basis, such as:

a. "ARF units have historically failed to mobilize a large number of their personnel, who plead medical and hardship reasons to avoid call-up."
b. "Many critical crew positions in the ARF are occupied by airline pilots, who are often unavailable for immediate call-up."
c. "ARF flying accident rates are higher than USAF rates."

As part of the study effort we developed a consistent and objective cost methodology for comparing the relative costs of active and ARF flying squadrons and their associated support. We also modified Rand's total force cost model to take account of the unique attributes of the reserve forces, and we expanded the data base to include all of the units and support activities of the Air Reserve components. This work is described in the companion volume, R-1977/2-AF, *The Air Reserve Forces in the Total Force: Vol. II, Cost Analysis and Methodology*.

Application of this methodology to compare the relative costs of several examples of active and ARF tactical airlift and fighter units indicated that net savings in annual operating costs of about 30 percent can be anticipated from additional transfers of such aircraft to

the ARF, *provided* the ARF squadrons retain the same number of UE aircraft and wartime missions as the active force squadrons, and roughly identical manning. However, these potential savings are significantly reduced when the UE strength is set at levels that are considerably below what is considered normal in the USAF--e.g., the "half squadron" C-130 units--and support manning is authorized beyond the apparent wartime needs of the units.

Although the promised economies from transferring additional missions and forces to the ARF are a powerful incentive, we find that opportunities to take advantage of them are less than generally realized because of the requirement to deploy forces overseas in peacetime, the resultant rotation base required in the CONUS of approximately equal size, high readiness rates and high activity levels which often necessitate full-time participation by assigned personnel, and the training base of new or "greening" personnel which is proportional to the overall size of the active forces.

Programs to provide the overseas presence through additional dual-basing or short rotation tours, where feasible, would increase the opportunities for potential reserve participation. Also, some relaxing of readiness criteria, where the potential savings are commensurate with the increased risk, would open up some new directions for ARF participation; for example, in the manner of the SAC air refueling mission.

The relatively fixed ARF flying unit structure, which contains a mix of 144 squadrons, has evolved as a result of a variety of influences, many of which are not directly correlated to perceived military requirements. With this large ARF unit structure on the one hand, and the reduced opportunities for modernization caused by the low rate of aircraft procurement (and consequently longer first-line active service life of the present aircraft types) on the other, it would seem that the ARF is likely to have a large proportion of its forces under-equipped or equipped with marginally capable aircraft into the foreseeable future. Although marginally capable units have heretofore generally been counted as a cost saving by virtue of their being retained at lower cost in the ARF, when compared with their wartime worth they appear rather to represent more of an additional and unnecessary cost. Elimination of the

fraction of the marginal squadrons that cannot be modernized in a reasonable time period, and consolidation of the rest into more economically scaled units, could release funds that could then be used to better advantage in the procurement of new equipment for a smaller, but more effective Air Reserve Force.

The new flight simulators that are being developed to enhance aircrew training tend to be less cost-effective for the ARF than for the active forces. This is explained by the fact that ARF crews are paid for days worked (additional training may translate into additional crew pay) and ARF units have a more dispersed beddown (requiring either more simulators or more pay, travel, and per diem expense to make use of centrally located simulators). If the flight simulators achieve their goal to dramatically improve aircraft training, they will provide one more incentive for the ARF to begin moving toward greater consolidation of its forces.

Barring a reduction in the number of marginally effective ARF units, steps could be taken to reduce their drain on the ARF budget. The present policy of applying the same readiness criteria to all ARF units assigns a disproportionate and nonproductive share of resources to certain lower priority, transition units. Significant cost reductions could be achieved simply by altering the stringent readiness requirements for the marginal units and authorizing lower manning levels and flying rates.

Roughly one-third to one-half of the manpower of an ARF flying unit is devoted to support activities that, under current plans, are not needed for its support.* These support elements are holdovers from an earlier organizational structure that was designed for self-sufficient ARF units intended to operate from austere airfields in time of war. The present plan is for flying units to deploy on established Air Force operational bases. The gaining commands no longer plan to move such support units in the ARF flying unit mobility packages, and so the justification for continuing to maintain the

*The statements in this discussion of ARF support do not apply to the comparatively few ARF units that are expected to be self-supporting in time of war, e.g., air defense units.

support units has been changed to provision in time of war of support augmentation to the Air Force as a whole. In peacetime they are supposed to furnish support services to their parent units, in the same manner as their counterparts in the active forces.

We believe these justifications deserve closer scrutiny. Taking the combat support of the deployable flying units as an example, the assumed contribution of the 20,000 reserve personnel in this skill area should be weighed against their estimated annual cost of over $60 million. In the evaluation of their wartime worth they are customarily considered a free resource, their peacetime costs offset by the support services they allegedly provide to their parent flying units. Yet it would seem doubtful that much of their cost could be justified on the basis of their peacetime contributions during once-a-month reserve drill weekends--given the existence of the large full-time civilian workforce that is authorized to each ARF flying unit to provide for its needed peacetime support, the availability of mobility support personnel with similar skills, and their own training requirements.

Apart from the financial considerations, the collocation of these support elements with the flying units appears to undercut the flexibility and readiness of the primary combat elements. In many cases, for example, efforts to man these support positions competed with attempts to man essential operations and maintenance authorizations. Given the limited number of potential recruits in any local area, that policy of collocating support units with flying units ultimately has the effect of constraining the possible beddown locations of ARF units to a limited number of relatively high-density population centers.

ANG and USAFR manning policies for civilians in peacetime support activities differ markedly. The USAFR uses regular civilians for base support, whereas the ANG uses Air Technicians--civilians who are required to be reservist members of the units. Since the Air Technician-reservists are paid in both roles it is possible that the combined pay will attract better qualified, career personnel* and the ANG approach,

*It also may be an effective way to recruit reservists having certain hard-to-get skills.

therefore, may be preferable for manning *some* of the civilian support jobs, i.e., up to the number of reservists who are needed for assignments that involve deployment in time of war. Beyond that number, the USAFR approach seems better: For support tasks with post-mobilization requirements at the home station, two individuals--a civilian and a reservist--can be acquired under the USAFR manning policy for the cost of one Air Technician. Alternatively, in the absence of such a corresponding wartime support need, only the civilian worker need be funded.

The ARF enlisted grade structure imposes a constraint on the procurement of otherwise available and experienced prior-service people. Despite the higher pay of prior-service personnel in the grade of staff sergeant, they actually cost less overall than new nonprior-service personnel because of training cost avoidance and their significantly lower turnover rates. We conclude that a notable increase in capability and a decrease in overall costs could be achieved by a moderate restructuring of ARF enlisted grade authorizations, directed toward greater procurement of prior-service personnel.

On the basis of our study we have concluded that the Air Force, in its reserve components, has developed a remarkably effective volunteer and part-time force, very much in the spirit of the total force policy. This force is being modernized as new equipment reaches the active inventory, as well as by delegating new roles and missions to the ARF that appear to be appropriate and prudent; but we believe that if the ARF is to realize its full potential as an effective, efficient, and economical augmentation force, steps must also be taken to modernize its organization and to revalidate its unit and manning requirements. The tools and analytical techniques that were developed during this study are intended to assist the Air Force in the evaluation of such issues, as well as in the analysis of alternative force mixes aimed at producing the preferred balance of active and reserve units in the total force for any given budget level.

ACKNOWLEDGMENTS

We are especially appreciative of the assistance given us by Major General John Pesch, Chief, Air National Guard, and his staff; by Major General William Lyon, Chief of the Air Force Reserve, his staff, and the personnel at Air Force Reserve Headquarters, Robins AFB; by Colonel James Reeves (AF/XOXFT) and Colonel James Cronin (AF/PRM), acting as co-Offices of Primary Responsibility within Hq USAF; and by the commanders and staffs of each of the units we visited. (This acknowledgment does not, of course, imply agreement with the findings and conclusions herein.) Significant research contributions were provided during the early part of the study by C. L. Freeman and Annette Bonner, consultants to The Rand Corporation.

CONTENTS

TABLES

I. INTRODUCTION AND BACKGROUND

Since the 1960s, a series of events have occurred that together have markedly enhanced the potential wartime worth of the Air Reserve Forces (ARF) as the primary augmentation for the active forces. These events include the active force reductions following the winding down of the Vietnam War, which released experienced potential recruits for the ARF as well as some fairly modern equipment; the institution of the all-volunteer force, which, in drying up the draft-induced source of recruits, led to programs aimed at encouraging more prior-service individuals to join the reserves; and the progressive budget crunch, which focused increasing attention on the mix of active and reserve forces. The combination of equipment modernization and the upgrading of the experience levels (and, notably, the motivation and maturity) of its personnel has significantly improved the ARF military posture. Yet at the same time, there is evidence of a resistance to changing the overall size of the reserve forces and of the support organizations of the ARF, even when such changes could lead to a more efficient and economical operation. Other than for some recent modest tailoring of units, the organizational makeup and size of the ARF have remained almost unchanged over the past 10 years, despite the fact that during that time the active forces have undergone almost continual change. The nature of the ARF doubtless demands a certain level of organizational stability, without which it could not exist as an augmenting force of civilians who elect to participate, in a subsidiary sense, as military personnel. Nonetheless, the value of the ARF is in direct proportion to its ability to remain responsive to the same changing requirements that affect the active forces.

In 1970, the Secretary of Defense introduced a new "total force concept" in which the reserve forces were to be considered concurrently with the active forces in all aspects of planning, programming, equipping, and employment. This novel and far-reaching policy of force integration called for a reevaluation of Air Force planning methods and policies then in effect and the institution of studies to develop

new insights and approaches that would ensure a forthright but prudent implementation of the OSD directive.

As a part of this effort, the Director of Plans, DCS/Plans and Operations, Headquarters USAF, requested that Rand "undertake a study which would evaluate varying active/reserve force mixes in terms of total cost, capabilities, and responsiveness to and availability for peacetime/wartime requirements."

This research charter, subsequently refined through a series of meetings with the Air Staff, was ultimately directed toward the evaluation of ARF costs and capabilities, and the formulation of both a methodology to analyze force structure and evaluation techniques, rather than toward the evaluation of specific alternative force mixes. The rationale for this redirection was that the study of military force structure requirements, and thus the generation of total force objective requirements, should properly be left to Air Staff planners.

Given this orientation, we defined a set of specific research tasks: formulate a force structure tradeoff methodology that enables evaluation of unit effectiveness; devise a total force cost model;[1] design a data collection to help sift through background information and illuminate the policies and practices that affect efficiency and effectiveness of the ARF; and conduct the evaluations and analysis necessary to identifying those organizational, manning, and resource consumption areas that could be modified to improve the efficiency of the ARF. Previous studies of the ARF have concluded that the ARF flying units have lower peacetime sustaining costs than their active counterparts. This study validates that finding. However, it is our view that such findings are shallow truths if the units are neither effective nor economical when examined in the context of their intended Air Force mission.

To gain a clear understanding of the complexities of ARF costing, manning, and organizational makeup, as well as to identify the significant differences between the two components of the ARF (the United States Air Force Reserve (USAFR) and the Air National Guard (ANG)), we conducted interviews and gathered data at more than 30 USAFR and ANG flying units, as well as at the several ARF headquarters, Tactical

Air Command and Military Airlift Command headquarters, and at the Air Staff. The units selected were a reasonable cross section of the various kinds of bases, typifying the various missions and weapon systems to be found in both the ANG and the USAFR. We contacted a wide variety of people, many of whom were eager not only to respond to our basic inquiries but also to offer their opinions and perceptions to amplify and clarify the specific data that we had requested. As a result, we came to understand a great deal more about the ARF than could have been possible from merely examining the bare data, and we concluded that, in addition to the purely objective data analysis and interpretation, we should document the more important subjective observations as well.

We have organized the remainder of this report to present background data, methodology, and analysis of the force structure, organization, cost, and effectiveness of the ARF. Section II is a broad overview of ARF manpower, equipment, basing, organization, and operations. It serves both to describe the status quo and to lay the groundwork for more detailed and analytical consideration of particular features of the ARF later in the report.

Section III contains a point-by-point discussion of widely prevalent attitudes toward the ARF of headquarters staff officers whom we interviewed. While their remarks often represented purely personal appraisals, we soon detected a consistent pattern of disparagement that is seldom expressed officially but that apparently pervades the thinking of the rank and file and, to some extent, the upper command echelons of the Air Force. By openly and fully discussing the basis for and merit of these rather widely held perceptions, we seek to clarify the dominant issues and to help provide the basis for a better understanding of the ARF within the active establishment.

Having established, at least in broad outline, what the ARF is and what it is not, the discussion in Sec. IV turns to the subject of force structure. The Air Force's posture and total force policy are discussed, along with various force structure issues that were found to have a practical bearing on the size and composition of the ARF. We cite the steps that have been taken to integrate the ARF more fully

into the Air Force's mainstream. We then address ongoing policies and influences that tend to inhibit the full realization of the ARF's inherent cost advantage.

Section V describes three case studies in which similarly equipped active and ARF units possessing fighter, reconnaissance, and airlift aircraft are compared to identify possible inherent limitations of ARF units (compared to active units). We examined all available and comparable performance indicators, as well as such personnel attributes as the experience levels of pilots and maintenance personnel, to infer how well the units might perform under combat conditions. We believe that this technique provides an illuminating indication of the comparative capabilities of the units.

Section VI focuses on ARF efficiency. The approach is eclectic and wide-ranging--grade structure, beddown, and readiness standards represent but a sample of the issues addressed. In each case the present policy is reviewed and an alternative proposed; where possible, the potential cost savings are estimated by application of Rand's total force cost model, FORCE, described in detail in the companion volume to the report.(1) Finally, section VII summarizes the principal observations and conclusions of the study.

II. OVERVIEW OF THE AIR RESERVE FORCES

In the context of active/reserve force mix analysis, it is convenient to restrict the definition of *reserves* to those forces with the potential to augment the total force in a substantial and timely fashion. In the case of the ARF, this means the 144 units of the Selected Reserve engaged in flying activity. These flying units account for most of the ARF budget. The remaining components of the ARF, and the overall structure of the reserves, while doubtless important in other contexts, are treated only peripherally.

There are three major categories of reserves: Ready, Standby, and Retired. The Ready Reserve consists of members on active duty, units and members in the Selected Reserve, and the Individual Ready Reserve. All members in *units* are in the Selected Reserve; they participate in 24 or 48 inactive duty training periods annually and undertake 12 or more days of active duty training each year. The Selected Reserve receives priority in the allocation of equipment. Its members may be activated involuntarily either in a national emergency declared by Congress or the President, or in time of war, or when otherwise authorized by Congress. The Individual Ready Reserve provides a pool of additional manning for the USAF's wartime needs that are anticipated but not clearly established. Most members of this category have served on active duty but have not completed their military service obligation; since the end of the draft, their numbers have been declining steadily.

The Standby Reserve consists of persons who have completed all required active duty and Ready Reserve service and who have elected to serve the remaining portion of their statutory six-year military obligation in the Standby Reserve. Most do not train. They are not eligible for pay, Congressional action is necessary for their mobilization, and, in addition, the Director of the Selective Service must make individual determinations as to the availability of each member. The Retired Reserve is made up of reservists who have been transferred to it upon their request, or who have been mandatorily retired because of age or

years of service. Eligible members receive pensions beginning at age 60. Mobilization requires Congressional action.

The numbers of reservists in each of these categories are shown in Table 1, which also displays the individual compositions of the U.S. Air Force Reserve and the Air National Guard.* The minimum average

Table 1

AIR FORCE RESERVISTS, BY PLACEMENT CATEGORY

(As of April 1975)

ARF Component	Placement Category				
	Selected	Individual Ready	Standby	Retired	Total
U.S. Air Force Reserve					
Officers	11,010	18,450	33,981	106,193	169,634
Airmen	36,975	73,380	9,776	167,564	287,695
	47,985	91,830	43,757	273,757	457,329
Air National Guard					
Officers	11,628	--	--	--	11,628
Airmen	82,427	1,031	--	--	83,458
	94,055	1,031	--	--	95,086
Total					
Officers	22,638	18,450	33,981	106,193	181,262
Airmen	119,402	74,411	9,776	167,564	371,153
	142,040	92,861	43,757	273,757	552,415

SOURCES: Refs. 2 and 3.

strength of the Selected Reserve in each reserve component is established annually by the Congress. For FY 1975, the authorized strength of the USAFR's Selected Reserve was 51,319; for the ANG it was 95,000. The Selected Reserve strengths programmed for FY 1976 are shown in Table 2.

SELECTED RESERVE UNIT ORGANIZATION AND MANNING

As noted earlier, the focus of this study is the 144 units of the Selected Reserve engaged in flying activity, which typically have the

*The membership of the latter is restricted by law to the Ready Reserve.

Table 2

ARF SELECTED RESERVE FORCE STRUCTURE REQUIREMENTS, BY TYPE OF UNIT

(FY 1976)

U.S. Air Force Reserves			Air National Guard		
Type of Unit	Number of Units	Programmed Average Strength	Type of Unit	Number of Units	Programmed Average Strength
Airborne early warning	1	610	Air defense	13	13,530
Tactical fighters	7	4,406	Tactical fighters	30	25,502
Special operations	2	857	Tactical reconnaissance	9	7,115
Tactical airlift	20	12,888	Air refueling	12	8,086
Associate airlift	18	9,633	Special operations	--	340
Aerospace rescue/recovery	4	708	Electronic warfare	1	941
Weather service	1	230	Tactical air support	7	5,424
			Tactical airlift	17	13,578
			Aerospace rescue/recovery	2	1,596
Total flying units	53	29,332	Total flying units	91	76,112
Aerial port	47	5,143	Control & surveillance	3	687
Maintenance & supply (mobile)	14	941	Tactical air control systems	36	5,349
Aeromedical evacuation	20	1,569	Communications	68	9,727
Civil engineering	36	3,008	Weather	40	618
Medical service	13	1,862	Civil engineering & heavy repair	2	380
Other nonflying units	9	800	Other nonflying units	81	2,006
Total nonflying units	139	13,323	Total nonflying units	230	18,767
Initial active duty for training	N/A	1,473	Initial active duty for training	N/A	(a)
Mobilization augmentees	N/A	7,661			
Grand total	192	51,789	Grand total	321	94,879

SOURCE: Ref. 4.

NOTE: N/A = not applicable.

[a]A programmed 2000 ANG nonprior-service enlistees are distributed by their designated post-training assignments.

following organizational elements:

Wing or group headquarters
- Operational (flying) squadron
- Consolidated aircraft maintenance squadron
- Combat support squadron
- Tactical hospital/clinic
- Mobility support flight
- Weapons system security flight
- Aerial port flight (airlift unit)
- Aeromedical evacuation flight (airlift unit)
- Civil engineering flight
- Communications flight

Although ARF units are now expected to deploy to and operate from established in-theater (forward) bases, this typical unit structure is similar to that of ten years ago, and was so constituted to provide a capability for each unit to mobilize, deploy, and operate independently from any suitable airfield. Moreover, a mobility support flight has been formed within all units with overseas deployment missions to provide the relatively small base operating support augmentation that would be needed when deployment to an established forward base occurs. Although this seems to preclude the requirement for mobilizing the rather large combat support squadron, deployable units now have both a mobility support flight *and* a combat support squadron.

All 144 flying units are equally subject to mobilization, but only certain elements are considered to be part of the mobility package directly involved in the operation, maintenance, and support of aircraft operations. These tactical elements are headquarters, flying squadrons, maintenance squadrons, weapons system security flights, and mobility support flights.* The remaining support elements, some of which in peacetime are nominally assigned as part of the flying units,

*Units that are not intended for overseas deployment, e.g., air defense, do not have mobility flights.

are specialized units whose wartime missions primarily support Air-Force-wide requirements. Tables 3 and 4 show the overall manpower authorizations for these tactical and support elements, respectively.

Table 3

MANPOWER AUTHORIZATIONS FOR ARF TACTICAL ELEMENTS
(FY 1976)

Elements	ANG	USAFR	Total
Wing/group headquarters	4,595	1,783	6,378
Flying squadrons	8,293	7,378	15,671
Maintenance squadrons	24,046	12,662	36,708
Weapons system security flights	2,038	846	2,884
Mobility support flights	3,377	1,453	4,830
Total	42,349	24,122	66,471

SOURCES: Refs. 5 and 6.

In the customary description of ARF flying units, no distinction is made between the tactical and unit support portions; moreover, these collocated support elements typically are included in the cost of operation of the flying units, even when they do not contribute materially to the flying units' support. In this report, in contrast, we will discuss the flying units in terms of the elements listed in Table 3, in consonance with Air Force practice, and the support elements will be treated as separate entities.*

Although it is generally supposed that ARF units are deliberately organized and manned to make them mirror images of active units, there are actually some rather significant differences between them. For example:

1. Peacetime administrative lines for the USAFR and ANG are unlike those in the active forces: The USAFR headquarters provides guidance through its three geographically structured numbered Air Force

*The rationale for this approach is discussed below, in Sec. VI.

Table 4

MANPOWER AUTHORIZATIONS FOR ARF SUPPORT ELEMENTS
(FY 1976)

Elements	ANG	USAFR	Total
Air Force Logistics Command	N/A	424	424
Aerial port	480	6,760	7,240
Aeromedical evacuation	484	1,882	2,366
Civil engineering flights	8,162	2,960	11,122
Civil engineering, heavy repair	418	417	835
Combat support	20,019	3,394	23,413
Tactical hospitals/clinics	2,999	938	3,937
Medical service squadrons	N/A	2,002	2,002
Direct air support centers	528	N/A	528
Supply	1,594	273	1,867
Mobile maintenance	N/A	790	790
Reconnaissance technical squadrons	160	N/A	160
Air Force communications service	2,539	1,015	3,554
Mobile communications and air traffic control centers	7,093	N/A	7,093
Tactical communications	6,536	N/A	6,536
Electronic installation	3,584	N/A	3,584
Aircraft control and warning	791	N/A	791
Weather	683	N/A	683
Air Force bands	420	N/A	420
Security police	N/A	108	108
Central, state, and regional headquarters	2,500	375	2,875
Air Training Command field training	17	N/A	17
Total	59,007	21,338	80,345

SOURCES: Refs. 5 and 6.
NOTE: N/A = not applicable.

headquarters, whereas the ANG's lines are from the National Guard Bureau in the Pentagon, through the adjutants general of the states.

2. The predominant ARF wing/group organizational structure is unlike the active units' wing/squadron structure. The interjection of group headquarters between the wing headquarters and tactical squadrons is dictated by the typical single-squadron basing of ARF units in peacetime. Wing headquarters are located on about one base in three. In the absence of a wing headquarters, a group provides overall command

for the base's tactical squadrons and support elements. Bases where a wing headquarters is in command more nearly match the active units' organization; however, the ARF wing's direct operational control is limited to the units with which it is collocated, and this normally includes only a single flying squadron. With regard to its other assigned units (often located in other states), the wing oversees their compliance with directives, policies, and regulations of higher headquarters, and it has control of the allocation of training man-days. Given present wartime deployment plans, which will reconstitute the ARF tactical units as integral parts of deployed active wings, both the ARF group and wing headquarters organizations will be superfluous. However, they may be a useful source of trained staff for fleshing out the active wings, particularly wings augmented with older aircraft with which the active commanders have had little recent experience.

3. ARF maintenance organizations are consolidated squadrons geared to accomplish organizational, field, avionics, and munitions maintenance, whereas active wings are serviced by separate squadrons organized on those functional lines. Therefore, the ARF unit is uniquely capable of operating alone, and it has the additional manning and equipment this requires. But it must reorganize in accordance with AFM-66-1[7] standards if it integrates with an active unit.*

4. ARF units are provided manpower grade and skill authorizations based upon USAF standards, but they can also request changes to meet their special requirements. As a result, the ARF grade authorizations are in many cases higher than those of counterpart active units.

5. The major share of the ARF's grade advantage derives from its proportionately low number of E-3s and its high number of E-5s and E-6s, not, as is commonly supposed, because of significant inflation of the supergrade (E-8 and E-9) authorizations.†

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*Currently, the Military Airlift Command (MAC) is reorganizing MAC-gained reserve tactical airlift units into AFM 66-1 configured maintenance squadrons in lieu of the consolidated aircraft maintenance squadrons.

†E-3, airman 1st class; E-5, staff sergeant; E-6, technical sergeant; E-8, senior master sergeant; and E-9, chief master sergeant.

6. ARF personnel differ significantly from their active counterparts not only by their part-time nature, but also by their average age and experience. ARF pilots are somewhat older than active pilots on average (35 years to 31 years, respectively) and they have flown more (see Table 5).

Table 5

ACTIVE AND RESERVE PILOTS' AVERAGE TOTAL FLYING HOURS

Component	Fighter Pilots	Airlift/Tanker Pilots	All Pilots
USAF	2,007	2,065	2,043
USAFR	2,273	3,234	3,189
ANG	2,365	3,609	2,862

SOURCE: Air Force Inspection and Safety Center.

The average ARF aircraft maintenance worker, including Technicians and part-timers, has about 10 years of maintenance experience, compared to about 6 years of experience, on average, for the actives. Even more striking, we believe, is the experience distribution of the respective work forces: nearly 50 percent of the active aircraft maintenance work force has fewer than 3 years experience; the comparable ARF figure is about 10 percent.

CIVILIAN MANPOWER

When the ANG evolved from the militia, civilian "caretakers" were employed to maintain equipment and to keep the resources in a ready condition. Today, both the USAFR and the ANG employ "Technicians," who must also be military members of the unit in which they are employed as full-time civilians during peacetime. ANG Technician requirements are detailed in Title 32 U.S. Code, Section 709; the existence of USAFR Technicians results not from a specific public law but rather from a 1959 agreement between the Air Force and the Civil Service Commission.*

*Technicians of the USAFR are hired and administered under civil service regulations and they enjoy the full protection and benefits of

Virtually all ANG civilians are Technicians, whereas more than 35 percent of the USAFR civilians are non-Technicians whose services are exclusively in support of the unit under peacetime, unmobilized condition (see Table 6). This full-time civilian force constitutes the essential peacetime support structure of the ARF and forms the basis for the normal training and operational activities of the units.

Table 6

ARF CIVILIAN AUTHORIZATIONS

(End year strength FY 1976)

Component	Technicians	Other	Total
ANG	22,273	1,430	23,703
USAFR	7,217	4,285	11,502
Total	29,490	5,715	35,205

SOURCE: Ref. 8, pp. 188, 216.

Upon mobilization, the Technicians revert to their military status and become indistinguishable from the part-time reservist members of their organizations. Most of the "pure" civilians are associated with base support operations, such as comptroller, personnel, supply, transportation, and services, and are not subject to mobilization or deployment.

BEDDOWN

Types of beddown locations of the 144 flying units of the Selected Reserve, shown in Table 7, strongly differentiate ANG and USAFR practices--the USAFR is situated on active Air Force bases in about the same proportion that the ANG is situated at commercial airports. Presumably,

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civil service status. ANG Technicians, on the other hand, are subject to the provisions of Public Law 90-486, which authorizes the state adjutants general to employ and administer the Technicians of ANG units in their states. Under the provisions of P.L. 90-486, ANG Technicians lose their civil service status if they cease to be members of an ANG unit, and many of the federal employee protections relating to hiring and dismissal that are conferred by Title 5 of the U.S. Code are specifically denied them.

beddown at an active base is considered desirable where feasible, but because many ANG units are in states without active Air Force bases, they are necessarily located as tenants on available commercial airports. Utilities and housekeeping services and the use of airport facilities by the ANG are arranged through negotiated service contracts. Approximately three-quarters of the cost is reimbursed to the individual states by the federal government.

Table 7

ARF UNIT BEDDOWN

(FY 1976)

Type of Location	ANG Units		USAFR Units		Total Units	
Air Force base	13	(14%)	39	(74%)	52	(36%)
Commercial airport	68	(75%)	7	(13%)	75	(52%)
ANG base	6	(7%)	2	(4%)	8	(6%)
USAFR base	1	(1%)	3	(6%)	4	(3%)
Naval air station	3	(3%)	2	(4%)	5	(3%)
Total	91	(100%)	53	(100%)	144	(100%)

SOURCE: Ref. 9.

EQUIPMENT

Table 8 shows the ARF flying unit composition as of October 1976. Approximately 40 percent of the squadrons were flying aircraft models that were no longer in the USAF active inventory. By the end of the decade, many of the squadrons are programmed to receive newer aircraft as the next generation of tactical aircraft--F-15s, F-16s, and A-10s--begins to enter the active inventory. However, for reasons that will be discussed subsequently, there is a trend toward reduced unit equipment (UE) aircraft strength as the ARF squadrons convert to the newer models.

FLYING ACTIVITY

In general, ARF units fly about 70 percent of their sorties Tuesday through Friday and 30 percent on weekends (see Table 9). All of the bases we visited emphasized weekday flying to avoid peaks in

Table 8

UNIT COMPOSITION OF THE AIR RESERVE FORCES

(October 1976)

Aircraft Type	Number of USAFR Units	Number of ANG Units	Total Number of ARF Units
A-7	0	7	7
F-4	0	2	2
RF-4	0	7	7
RF-101[a]	0	2	2
F-100[a]	0	16	16
F-101[a]	0	3	3
F-105[a]	3	4	7
F-106	0	6	6
EB-57	0	2	2
A-37[a]	4	2	6
AC-130	1	0	1
O-2[a]	0	7	7
EC-121	1	1	2
C-7[a]	2	1	3
C-123[a]	4	0	4
C-130	14	16	30
C-9	1	0	1
C-141	13	0	13
C-5	4	0	4
KC-97[a]	0	8	8
KC-135	0	5	5
RESCUE	4	2	6
CH-3	1	0	1
WC-130	1	0	1
Total	53	91	144

[a]Not currently in active inventory, or programmed for early phaseout.

their training programs.* We asked three units about their typical flying schedules and learned the following:

*There is also a trend, especially for crews in airlift units, to take the 15 day active duty training tour a day at a time during the year, rather than during a two-week "encampment."

Table 9

RESERVE UNIT WEEKLY FLYING SCHEDULES

Unit[a]	Aircraft	Sorties Scheduled							
		Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Total
68 TAS (USAFR)	C-130	0	6	7	6	4	6	3	32
106 TRS (ANG)	RF-4	0	0	5	13	13	12	6	49
120 TFS (ANG)	A-7	0	12	12	12	12	12	6	66
Total		0	18	24	31	29	30	15	147

[a]TAS (tactical airlift squadron), TRS (tactical reconnaissance squadron), and TFS (tactical fighter squadron).

Because of union constraints and overtime pay restrictions, the full-time Technician force provides almost all maintenance and other support during the normal work week.* Preflight inspections conducted on Friday carry the unit through the weekend, but since these inspections are valid for 48 hours only and little maintenance is accomplished on weekends, there is usually no flying scheduled for Monday.

*Part-time (non-Technician) reservists participate during the week to a small extent in some units but, for the most part, their participation is limited to the single unit training assembly weekend each month.

III. REFUTATION OF SOME CURRENT PERCEPTIONS OF THE ARF

During our extensive private interviews with officers and airmen in active forces headquarters and units, we were repeatedly exposed to expressions of strong reservations regarding the effectiveness of ARF units, invariably prefaced by: "I support the total force policy; however ...." We have identified and paraphrased several common perceptions embedded within these attitudes and discuss them in turn below.

ARF ECONOMIES RESULT ONLY FROM REDUCED FLYING HOURS

ARF units fly about half as many hours as similarly equipped active units; their lower cost is almost entirely attributable to this difference in flying activity.

ARF units currently fly about 65 percent of the hours that similarly equipped active units fly and this will increase to about 75 percent by FY 1981 because active units are gradually flying less--largely as a result of the high cost of fuel and the consequent increased use of simulators. ARF line crews are currently programmed for about 135 hours per year in fighter units and 180 hours per year in airlift units. These figures will not change appreciably. Aircrews in headquarters and other overhead positions, programmed for about 120 hours per year in active units and about 100 hours per year in the ARF, are more numerous in the ARF, serving further to increase the ARF versus active unit flying-hour ratio, as active unit line crew hours decrease.

At present flying rates, less than half of the cost differential between active and ARF units is attributable to the aircraft-related (flying-hour) costs--POL, depot maintenance, etc. The rest of the differential derives from the lower pay and support costs of reservists. The annual pay of reservist members of an ARF unit comparable in manning and equipment to one in the active force is less than 25 percent of the active unit's personnel expenditures. Although this differential is offset to some extent by the cost of the full-time ARF

Technician cadre, total personnel costs still account for more than half of the ARF unit's lower cost.

ARF MOBILIZATION IS HINDERED BY EXCESSIVE MEDICAL/HARDSHIP CLAIMS

Past mobilizations have shown that ARF units will fail to mobilize a significant number of people, because many claim medical and/or hardship deferments.

In the 1968 Southeast Asia and Pueblo mobilizations, of the 10,511 ANG personnel mobilized, 565 were discharged--445 because their terms of service had expired. Many of them had served out their tours on active duty. Forty-three were discharged for medical reasons, some acquiring physical disabilities as a result of accidents after mobilization. An additional 43 received hardship deferments. Medical/hardship discharges, therefore, amounted to less than 1 percent of the total mobilization force.

Earlier call-ups (resulting from crises in Cuba, Berlin, and Korea) appear to have had significantly higher dropout rates--on the order of 20 percent--in both ANG and the USAFR, as a result of rejections for physical reasons and delays granted for hardship. This experience motivated the ARF to institute stringent screening procedures designed to identify members of the Ready Reserve who would not be immediately available during a national emergency. At least annually, members of the Ready Reserve are reviewed to evaluate their training levels and to identify personal hardship conditions or conflicts with civilian occupations. Reservists not meeting the readiness requirements have been, in many cases, transferred to the Standby Reserve, retired, or discharged.

AIRLINE PILOT RESERVISTS ARE OF QUESTIONABLE VALUE

Many critical crew positions are filled by commercial airline pilots whose availability for rapid mobilization is questionable.

Approximately 30 percent of assigned ARF pilots hold full-time jobs as commercial airline pilots. Just as other members of the Selected Reserve, they must execute a Ready Reserve Service Agreement, certifying that they will remain *immediately* available for active duty

for a specified period of time and that they will not be released from this agreement unless certain conditions (none relating to civilian employment) have been met.

The availability issue surfaced in reference to the MAC/CRAF* pilot force in a 30 November 1970 memorandum from the Principal Deputy Assistant Secretary of Defense (Systems Analysis) to the Assistant Secretary of the Air Force (Installations & Logistics):

> Past mobility forces analyses have established the clear need for CRAF airlift augmentation to support our deployment objectives. With the additional emphasis on the use of National Guard and Reserve units in a future crisis and the large number of commercial airline pilots participating in Reserve programs, the possibility that individual aircrew members in CRAF and Reserve units are being counted twice against our total commitments becomes a matter of concern. A problem is most likely to arise with our mobility forces since the CRAF pilot is well suited to be a Reserve airlift pilot. I believe it is important that we determine the extent of this problem.

The Air Force response on 22 January 1971 stated, in part:

> In September 1970, the Military Airlift Command queried CRAF carriers for the total number of personnel and related Reserve/Guard commitments. Only four of the 24 CRAF carriers responded. However, the data provided by the four carriers tends to support the conclusion that CRAF carriers have more than an adequate number of aircrews to meet their airlift augmentation commitments after subtracting those aircrews with Reserve/Guard assignments. For example, of the 7274 aircrew personnel employed by the four carriers, 15 percent of the pilots, 18 percent of the flight engineers, and 2 percent of the navigators have a Reserve/Guard commitment.

The issue was more recently addressed by the Deputy Chief of Staff, Personnel, in a 15 December 1972 letter to the Commander, 834th Air Division (TAC). It had come to his attention that more than 42 percent of assigned C-130 pilots were commercial airline pilots as well:

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*Civil Reserve Air Fleet.

> My people looked into the situation; I feel confident that the number is not excessive. In my view, the crux of the matter is the possible impact of aircrew losses on the carrier's ability to discharge its Civil Reserve Air Fleet ...commitments. This has been reviewed several times, dating as far back as the Berlin Crisis in 1961. In each instance it was determined that there is not an excessive number of commercial pilots in the reserve components. The last study concluded that "...CRAF carriers have more than an adequate number of aircrews to meet their airlift augmentation commitments after subtracting those aircrews with Reserve/Guard assignments."
>
> The airline pilots have responded well to our previous mobilizations. In addition, I understand that, as a group, they make themselves available to fly frequently in a non-EAD* status. On balance, we seem to have a good thing going. We can put this one to rest.

Finally, we discussed the matter with numerous ARF unit commanders, most of whom felt that the airline pilots provided some of their most valuable and readily available resources. They did not agree that the pilots would respond more slowly than pilots with less mobile occupations.

ANG IS NOT RESPONSIVE TO USAF DIRECTIVES

USAFR units are more responsive than ANG units to USAF needs because USAF regulations are not mandatory directives to ANG.

When not in active federal service, ANG units are in fact governed by their own regulations. Such regulations are issued subject to the approval of the Chief of Staff, USAF, and by order of the Secretary of the Air Force (AFR 45-17, 28 December 1973(10)). The ANG's dual status (serving both the federal and state governments) makes some of the language in USAF regulations inappropriate; in practice, the ANG adopts USAF regulations, adapting them to fit their situation, in much the way that a major command issues its own implementing instructions. When ANG units are called into active federal service, members are governed by the same regulations as the active units.

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*Extended active duty.

THERE ARE POLITICAL AND LEGAL RESTRAINTS TO ARF MOBILIZATION

Political and legal constraints introduce uncertainties and probable delays regarding the rapid mobilization of ARF units, especially the ANG units whose participation is subject to approval by the governor.

The existing legal bases for mobilizing the reserves are briefly outlined below. Depending upon which statute is invoked, units may or may not be mobilized without the consent of the governor. Under 10 U.S.C. 673 all that is required is a Presidential declaration of national emergency to order members of the USAFR or ANG to active duty without their consent. In time of war or when Congress declares a national emergency (10 U.S.C. 672) there are no limitations on the duration of duty or number of reservists that can be called, and consent of the governor is not required. Under 10 U.S.C. 672(d), members may be called up only with their consent and with prior approval of the governor. Numerous other statutes exist to cover specific contingencies, such as repelling invasion or suppressing rebellion (10 U.S.C. 8500 and 8501), in which case the call-up is issued through the governor.

Quick response of ANG interceptor units in a crisis short of a declared emergency has been insured by agreements between Aerospace Defense Command (ADCOM), the gaining command, and the states wherein the governors have given their consent in advance to the ordering of such units to active duty for a period of 15 days. Similar arrangements are being established with SAC for the ANG KC-135 units.

As a practical matter, however, all *international* involvements have been handled by enactment of special legislation requiring no state approval. For example, an amendment to Public Law 89-687, the DoD Appropriation Act of 1967 (usually referred to as the Russell Amendment), was used as the authority for two Executive Orders (E.O. 11392 and E.O. 11406) that effected mobilization of USAFR and ANG units in early 1968. No state approval was required. Mobilizations for earlier contingencies were all affected through enactment of special legislation: Cuban Missile Crisis, October 1962, Public Law 87-734; Berlin Crisis, October 1961, Public Law 87-117; Korean War, 1950-51, Public Law 81-599.

Activation of the reserves for other than domestic purposes, requiring at a minimum the declaration of a national emergency, has significant national and international political consequences; on average, two weeks have elapsed (during consultations with the National Security Council, Department of State, and Congressional leaders) between an initial DoD proposal to use the reserves and the issuance of an actual order. While this delays availability of the reserves, it should be noted that introduction of regular forces into hostilities or into an area of imminent hostilities is also preceded by extensive consultation.

ARF ACCIDENT RATES ARE GREATER THAN ACTIVE FORCE RATES

ARF aircraft accident rates are significantly higher than the active units' rates.

It is especially important in comparing accident rates to be sure that the statistics involved in the comparison are truly comparable. Aggregate statistics for the six-year period from 1 January 1969 through 31 December 1974 for the entire USAF show 1109 major and minor aircraft accidents during 29.7 million flying hours, for a rate of 3.7 accidents per 100,000 hours, whereas the ARF incurred 202 accidents during 3.4 million flying hours for a rate of 5.9 accidents per 100,000 hours.* This seems to represent a significant difference between the two forces. However, if the ARF accident rate is broken down into its two major parts, USAFR (2.0) and ANG (7.1), a different--but equally misleading--picture emerges. The problem with these comparisons is that USAF, USAFR, and ANG differ markedly in their complements of aircraft and missions and thus, also, in their relative exposures to risk. Of the USAFR's seventeen wings, for example, six are associate C-5/C-141 units and nine are tactical

*1975 and 1976 accident data, as reported in the respective USAF *Accident Bulletin* (Ref. 11), indicates that the ARF experienced a total of 45 major and minor accidents in approximately 1.1 million flying hours. This results in a rate of 4.1 accidents per 100,000 flying hours as compared to an overall USAF (excluding the ARF) accident experience of 179 accidents in approximately 5.4 million flying hours--3.33 per 100,000 flying hours.

airlift units,* which are, by their nature, relatively accident-free compared to, say, tactical fighter units. By contrast, the ANG's makeup is more heavily weighted toward higher-risk aircraft and missions:

ANG Units	Wings
Tactical airlift	4
Tactical air support	2
Air refueling	3
Tactical fighter	9
Tactical reconnaissance	2
Fighter interceptor	4
Total	24

The ANG accident rate was further influenced by the presence of some relatively "unsafe" aircraft, viz., the F-104 (25.2 rate), the F-84 (13.3 rate), and the F-100 (10.9 rate). These three high-risk aircraft, absent from the USAF inventory during this six-year period, accounted for nearly one-half of the ANG's tactical fighter flying hours.

One might argue, in fact, that the only appropriate comparison is between identical aircraft (see Table 10). From these data it is fair to conclude that, despite the ANG's relatively high overall rate, its accident potential is indistinguishable from that of the USAF for similar aircraft types and similar exposure to risk.

ARF TECHNICIAN COSTS ARE EXCESSIVE

An ARF Technician costs significantly more than his active duty counterpart because he "double dips" by receiving (1) full-time civil service pay as well as part-time reservist pay, and (2) he is entitled to civil service as well as military retirement pensions.

The direct pay and allowances and permanent change of station (PCS) travel of active duty officers and airmen are approximately

*The remaining two USAFR wings are equipped with tactical fighters.

Table 10

USAF AND ANG ACCIDENT RATES,[a]
SELECTED AIRCRAFT

(1 January 1969 through
31 December 1974)

Aircraft	USAF Rate	ANG Rate
O-2	1.7	1.9
C-130	2.1	2.6
T-33	3.9	3.8
F-102/F-106	8.5	8.8
F-105	12.7	13.3

[a]Rate is accidents per 100,000 flying hours.

equal to the civil service pay, benefits, and travel of Technicians of comparable grade, skill, and longevity; however, the Technician is also, as a condition of employment, a military reservist and therefore receives additional remuneration, which increases his cost somewhat.

Table 11 arrays the annual direct costs of a typical active duty colonel (O-6) on flying status and a comparable Technician GS-14/reservist O-6.* On this basis, the difference between the active duty colonel and his Technician counterpart, considering both civil service and reservist personnel costs for the latter, amounts to about 25 percent.

Table 12 compares the costs of an active duty technical sergeant (E-6) with eighteen years of service and a comparable Technician (Wage Board 10) holding a reserve military grade of E-6. It indicates, again, that the Technician/reservist costs about 25 percent more than the active duty individual.

These direct costs alone do not, however, provide a complete picture of the differences between Technicians and active personnel. To make the comparisons more complete, we have identified a number of indirect costs that are unique to the military personnel in the comparison. These include the costs of medical, base exchange, commissary,

*A detailed accounting of the cost estimates used in this section appears in the Appendix.

Table 11

COMPARISON OF THE ANNUAL DIRECT PERSONNEL COSTS OF AN ACTIVE DUTY O-6 AND A RESERVIST O-6/GS-14 TECHNICIAN

Cost Element	O-6, Rated, CONUS[a]		Cost Element	Technician GS-14/O-6
	Active	Reserve		
Basic pay	$26,492	$7,360	Basic pay	$31,837
Incentive pay	2,308	640	Other compensation[b]	180
Quarters	3,272	(c)	Benefits[d]	595
Subsistence	606	(c)	Travel and per diem	295
FICA	825	468	Retirement (funded)	2,229
PCS	755	--		
Subtotal	$34,258	$8,468		$35,136
			Reservist cost	$ 8,468
Grand total	$34,258			$43,604

[a]Continental United States.

[b]Overtime pay, night differential, and other premium pay.

[c]Minor cost; included in pay figure.

[d]Life insurance, health benefits, workmen's compensation, etc.

and formal training activities and the pay of personnel who provide base operating support (BOS) and medical services to military personnel and their dependents. Another element is the value of the tax advantage that military personnel receive in not being taxed on their quarters and subsistence allowances. Since Technicians, of course, pay for their housing and groceries with after-tax dollars, including an estimate of the value of this tax advantage puts the military and Technician pay on a more equivalent basis.

Tables 11 and 12 reveal another difference to be considered: Although the government provides retirement benefits for both Technicians and military personnel, only the Technicians' annual costs contain any explicit funding for such benefits. This reflects the fact that civil service retirement is funded (perhaps inadequately) during the employee's working years, whereas military retirement is not. It is possible to impute a comparable annual military retirement contribution based on the size of the annual pension payments and the duration of the pay-out period and, to make our comparisons more consistent,

Table 12

COMPARISON OF THE ANNUAL DIRECT PERSONNEL COSTS OF AN ACTIVE DUTY E-6 AND A RESERVIST E-6/WB-10 TECHNICIAN

Cost Element	E-6, CONUS		Cost Element	Technician WB-10/E-6
	Active	Reserve		
Basic pay	$ 9,130	$1,598	Basic pay	$12,809
Quarters	1,901	(a)	Other compensation[b]	180
Subsistence	865	(a)	Benefits[c]	595
Other allowances[d]	158	--	Travel and per diem	295
FICA	534	93	Retirement (funded)	896
PCS	460	--		
Subtotal	$13,048	$1,691		$14,775
			Reservist cost	$ 1,691
Grand total	$13,048			$16,466

[a] Minor cost; included in pay figure.

[b] Overtime pay, night differential, and other premium pay.

[c] Life insurance, health benefits, workmen's compensation, etc.

[d] Reenlistment bonuses, proficiency pay, and clothing maintenance allowance.

this was done using the same economic assumptions* and funding scheme† as the civil service plan. The estimated retirement contributions of the active duty personnel are considerably greater than those of the Technician/reservists because (1) Technicians contribute to their own retirement fund, (2) reservists accumulate retirement "points" at a rate that is only about 20 percent that of their active duty counterparts, and (3) active duty military personnel qualify for retirement benefits immediately upon retirement, whereas reservists must wait until age 60 and Technicians must wait until age 55-62 depending upon their time on the job.

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*Assumes 5 percent real (i.e., deflated) interest rate and no increase in real pay rates. Less conservative assumptions would result in higher retirement contributions for *both* military and Technician personnel but the rankings would not change.

†The retirement annuity fund is assumed to be accumulated during the employee's working years as a constant percentage of his basic pay.

Inclusion of the above indirect costs and imputed military retirement contributions dramatically increases the total cost of the active duty 0-6 and E-6, as shown in Table 13. These figures indicate that the indirect costs of the active military personnel may more than offset the higher, more visible, direct costs of the Technicians. Because of the conceptual difficulties in structuring the comparison and its sensitivity to differences in assumptions about career progression, years of service, geographic location, and the like, we hesitate to suggest that active duty military personnel are actually more expensive than Technicians. Nonetheless we can fairly conclude that when all of the direct and indirect pay, allowances, benefits, and other expenses are taken into account, the total annual cost of a Technician is not significantly greater than that of a comparable active duty officer or airman.

Table 13

TOTAL COST OF ACTIVE DUTY 0-6 AND E-6 COMPARED WITH TOTAL COST OF TECHNICIANS OF COMPARABLE RANKS (INCLUDING IMPUTED MILITARY RETIREMENT COSTS)

Cost Element	Active 0-6	Tech/Reservist GS-14/0-6	Active E-6	Tech/Reservist WB-10/E-6
Direct cost	$34,258	$43,604	$13,048	$16,466
Indirect cost				
Variable BOS/medical[a]	$ 2,500	$ 490	$ 2,500	$ 490
Other personnel costs[b]	4,748	504	1,858	95
Tax advantage	2,140	--	551	--
Military retirement[c]	6,755	795	3,150	183
Total indirect	$16,143	$ 1,789	$ 8,059	$ 768
Grand total	$50,401	$45,393	$21,107	$17,234
Grand total (rounded)	$50,000	$45,000	$21,000	$17,000

[a]Approximate cost of personnel in base operating support and medical activities whose number varies in proportion to the number of personnel supported.

[b]Medical, base exchange, commissary, and training costs.

[c]Inputed annual contribution. The civil service retirement contributions made on behalf of the Technicians are included in their direct cost figures: $2229 for the GS-14 and $896 for the WB-10.

IV. ACTIVE/ARF TOTAL FORCE MIX CONSIDERATIONS

Two seemingly unambiguous policy statements furnish the overall guidance for the Air Force's force structure planners with respect to the appropriate division of the total force between the active and reserve components:

- U.S. Air Force Basic Doctrine[12] stipulates that USAFR and ANG forces will be used to increase the capability, flexibility, and effectiveness of the (total) Air Force and should be taken into full account in Air Force planning and operations.
- An August 21, 1970, memorandum from the Secretary of Defense to the Secretaries of the military departments, on the subject of support for the Guard and Reserve Forces, directs that "Emphasis will be given to concurrent consideration of the total force, active and reserve....A total force concept will be applied to all aspects of planning, programming, manning, equipping and employing Guard and Reserve Forces...."

Given the overriding importance of the budget in force structure decisions, the relative cost advantage of reserve forces compared to their full-time active counterparts is an important advantage for the Reserve Forces. Because reserves are cheaper, there is a generally held view that as defense budgets decline, more of the total force structure should be transferred to the reserve side of the military establishment. The following figure is an over-simplification of the active/ARF force mix process, but it does serve to suggest that the above view may be in error. In this example, two alternative budget level lines AB and CD (whose slopes reflect the assumed active/ARF cost tradeoff relationship*) are superimposed on a series of equal military capability curves (isoquants). All of the Air Force's

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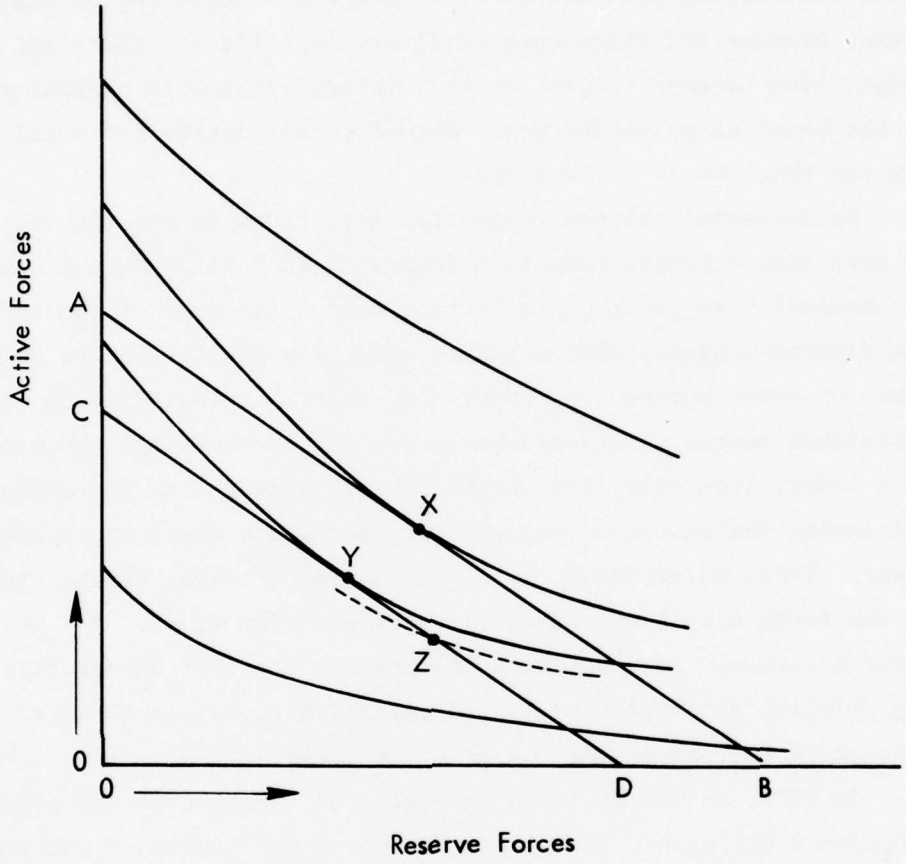
*The ratio of active to ARF relative costs is assumed to be 1.0:0.7 in this illustration.



Model for determining preferred active/ARF mixes for two assumed budget levels

missions are not equally amenable to the reserve form of operation. The missions that the ARF can absorb most easily are included in the area on the left, where the equal capability curves are steepest. The gradual flattening of the curves indicates a decreasing ability on the part of ARF units to perform the full mission capabilities of the corresponding active units, on a one-for-one basis.* Each of the budget lines shows the various proportions of active and reserve forces that can be funded for the given budget outlay; each equal capability curve

*For example, two ARF units might be needed to cover all aspects of an around-the-clock mission capability, one specializing in day operations and the other in the night segment.

shows the varying proportions of active and reserve forces that together produce the represented military capability. Where the assumed budget line becomes tangent to the highest attainable capability curve is the point at which the most cost-effective active/ARF total force mix for that sum is to be found.

By surveying the two tangential situations in the figure, it can be seen that a budget reduction from line AB to line CD does not lead automatically to *fewer* of the active forces and *more* of the ARF; rather, the diagram suggests that a budget reduction should lead to somewhat fewer of *both*--moving from point X to point Y. Insisting on an undiminished number of reserve units would lead the total force posture to a lower, less effective capability (intersect Z on the dashed curve). Increasing the amount of ARF substitution would drive capability still lower. This, intuitively, is a reasonable portrayal of the situation if the force mix is at the equilibrium position (i.e., "X") in the first instance. However, with the present state of uncertainty regarding relative active/ARF costs and capabilities, it is a matter of judgment where the proper balance of forces lies.

In 1974, an OSD decision involving ARF unit structure brought into the open a difference of opinion regarding the wisdom of cutting ARF unit strength as a part of an overall cut in the total force. What triggered the disagreement was OSD's decision to eliminate several ANG air defense interceptor squadrons in concert with similar cuts in the active sector. Faced with expanding military requirements and a declining defense budget, in real terms, OSD analysts judged a cut in the air defense forces to be the least detrimental to our security. Cuts were made in ADCOM and in ANG squadrons equipped with old F-102s and F-101s.

Congressional supporters of the reserve urged the Air Force to reconsider the reserve cuts and succeeded in establishing a "floor" under the existing 144 squadrons of ARF units. The Air Force, already in difficulty trying to modernize other reserve squadrons with equipment from its inventory, was called upon to find additional aircraft for the reinstated squadrons. Substantial stretch-outs in the first-line life of all aircraft, plus delays in the procurement schedules of

F-15s and A-10s that would have released F-4s and A-7s to the ARF, intensified the problem.* Foreign sales of inventory aircraft, whatever the merit on other grounds, further reduced ARF modernization opportunities. One can appreciate the complexity of the problems faced by the force planners who are charged, on the one hand, to develop a cost-effective, preferred total force mix but who may, on the other hand, have only a pro forma voice in the ultimate size and composition of the ARF portion of the mix.

While reductions in ARF unit strength have been blocked, the level of funding for aircraft procurement that is needed to properly outfit the existing reserve forces has not materialized. Instead, the Air Force has been pressed to generate the needed equipment from its internal resources. But, short of a substantial increase in aircraft procurement levels, the only route open to the Air Force authorities is to shift a significantly greater proportion of the active force aircraft and missions into the reserve sector, which they are reluctant to do. The inevitable result of this impasse is an ARF comprising largely outmoded aircraft that might be badly outclassed in today's air battle environment, and much of the remainder consisting of under-equipped squadrons of marginally first-line aircraft. This latter phenomenon results from a thin-spreading of the available surplus aircraft from the active inventory over the fixed number of ARF squadrons. The 8 UE C-130 squadrons are a notable example.(13) In terms of wartime capability, it makes little difference whether a force of, say, 192 aircraft is distributed among twelve 16 UE squadrons or 24 8 UE squadrons; but there is a significant difference in the cost of sustaining corresponding overhead and support activities year after year in peacetime. The smaller squadrons also forgo some other economies of scale.

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*The upgrading of tactical air units in the active forces will release substantial numbers of what are now first-line aircraft to the ARF over the next few years. However, most of the transferred F-4s will have seen about 15 years of use in the active forces before they reach reserve squadrons. The A-7s are quite new, with excellent strike systems, but aerodynamically they represent 1960s' technology. How long these aircraft should be considered combat-worthy depends, of course, on the rate of modernization of the air fleet of our principal adversary. This calls for a continual reassessment, but one suspects that before the mid-1980s these aircraft, too, will have become obsolescent.

During the next several years many of the ARF squadrons with the oldest aircraft will convert to newer equipment. Their place at the bottom of the scale, however, will be taken over by other squadrons whose equipment even now is only marginally effective. Thus, the stock reply to the question regarding the utility of these old aircraft models is that they are interim, continuity vehicles awaiting the newer and more modern aircraft; but this answer misses the real problem, namely, that, given the present aircraft active duty life cycle and procurement rate policies and an ARF of the present size, there always will be a significant fraction of the ARF unit structure, albeit different organizations at different periods of time, that cannot be equipped with modern combat-capable aircraft.

This chronic problem of retaining marginal aircraft in some fraction of the ARF is a new concern. In past years, the outfitting of reserve squadrons with outmoded aircraft was an acceptable economy because it was assumed that there would be time following mobilization for the reserve crews to make the transition to new first-line aircraft. The consensus now is that in future conflicts the decisive battles will be fought by the forces in-being. By the time the reserve crews can be reequipped and retrained the war will be over. If this is the case, of what use is that fraction of the ARF that is equipped with the old aircraft? Do these reserve squadrons represent a savings, as is generally believed, or are they a drain on our defense budget? Even if we credit these units with a marginal wartime role (e.g., perhaps at some point later on in a future war, the "obsolete" aircraft will be able to survive and contribute to the war effort, after the expected high attrition has taken its toll of the first-line aircraft on both sides), are there not some economies in support and operations that can be introduced to bring the cost of such units more in line with their expected contribution?*

The consequence of maintaining a larger ARF than can be properly equipped, or of equipping units at an uneconomic UE strength, or of operating marginal units at rates that support unrealistic readiness

*Some cost-reducing measures are suggested in Sec. VI.

criteria is that scarce resources are being wasted that could be used to better advantage in the procurement of new equipment for a smaller, but more effective Air Reserve Force. At about $10 million per squadron in annual operating costs, the potential savings are far from trivial.

Clearly, the nature of the reserve as a part-time occupation for members who are primarily non-mobile and obligated to their civilian occupations imposes a strong need for maintaining stability and minimal personnel turbulence within those units. Just as clearly, however, the evolving nature of the national security situation also requires an augmentation force whose personnel and units remain militarily viable; that is, subject to constant revision in response to the changing nature of the perceived threat, evolving alliances, changing operational environments, advancing technology, and equipment obsolescence. Retention of a fixed number of ARF units, which seems now to be the policy, provides the relative stability required for an ARF manned by volunteers, but it impedes the structuring of a least-cost total force designed to react to the changing national security environment.

In response to those who seek to modernize the ARF by phasing out active units and transferring their aircraft to the ARF, it should be pointed out that the part-time nature of reservist participation renders them less desirable for many roles and missions. For example, overseas stationing in peacetime, which is needed to reassure allies of our support and to provide an immediate response to surprise attack, generally is provided by active forces permanently stationed in situ. Overseas stationing, in turn, requires a sizable rotation base in the CONUS to permit the periodic exchange of assignments.* Reservists with jobs in the United States clearly are ineligible for these roles. Also,

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*To the extent that overseas commitments could be met by additional dual-basing or rotation assignments, there would be a double effect on reserve unit eligibility. Not only could the ARF participate in temporary deployments overseas (similar to the ANG's rotational "Creek Party"--European aerial tanker--operation), but the requirements for the CONUS rotation base that is needed to back up extended overseas assignments could be correspondingly reduced.

missions that must have a large proportion of full-time personnel or high levels of activity in peacetime are less appropriate for part-time reservists. Most strategic missions are generally thought to be in this category. Reservist aircrew scheduling problems require missions that permit a reasonable amount of preplanning.* Finally, there is the training base of new replacements and "greening" military personnel that obviously must be a part of the active sector.

When the missions and activities that must be limited to full-time active duty participants are set aside, what remains are CONUS-based forces governed by varying degrees of readiness and response time criteria. Many of these forces, of course, already are in the ARF. Whether others are eligible for transfer depends upon the ability of reserve units to meet the required wartime capabilities of the candidate missions--some missions appear to be more difficult than others for the reserve units to absorb within their allocation of training time--and how long it takes (politically and physically) to mobilize the ARF units, brush up their deficiencies, and deploy them. As we noted in Sec. II, the reserves have made great strides in providing *capability in-being*, and current policy calls for a mobilization and deployment time of 72 hours or less. This has opened up new areas of participation for reservists. In support of the total force policy, new roles and missions have been turned over to, or shared with, the ARF--including SAC's aerial refueling mission that, heretofore, had been performed by active forces only. This study and others are seeking out new total force options for the ARF and better analytical tools for performing force mix tradeoffs.

Some approaches for determining how much military capability may be lost by transferring units from the active forces to the ARF are discussed in Sec. V. No definitive answers are given, but available measures of military capability are described and their use in making capability comparisons between similarly equipped active and ARF units is illustrated.

A methodology for estimating the costs of active and ARF units, needed for making cost-effectiveness tradeoffs, is presented in

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*Reference 14, p. 1883.

R-1977/2-AF, the companion volume to this report. Although the cost model described in that volume allows comparison of the costs of increasing flying hours and man-day allocations (to enhance the military capability of the reserve units), the essential part-time nature of the ARF will tend to preclude any radical changes in these inputs. Thus, we believe that force planners involved with active/ARF force mix decisions will be faced with the task of balancing cost savings with diminished military capability. These tradeoffs probably will vary from aircraft to aircraft and between different kinds of missions, so the analysis will consist of finding the set that provides the preferred balance.

V. COMPARISONS OF ARF AND ACTIVE FORCE CAPABILITY

The companion cost analysis volume of this report[1] verifies the generally accepted thesis that rather significant savings in annual operating costs could be achieved by allocating a larger share of the total force to the ARF. But what would be the consequences of such transfers on our military posture? The cost savings that are inherent in the reserve operation stem primarily from the part-time nature of reservist participation and from a reduced flying program. Do these and other characteristics unique to reserve units degrade their wartime utility to a point that would make such transfers a bad bargain? Or does the generally greater experience level of reserve personnel offset their lower training rate? Are some missions more compatible to ARF operations than others? In this section we present evidence of ARF efficiency levels and attempt to address the question of relative active and ARF military capabilities--a matter of vital concern to the Air Force planners operating under the imperatives of the total force policy.

In the course of our study we visited a representative cross section of ARF flying units and were impressed by the skill and professionalism of their members. The average term of service of the aircrews and maintenance personnel exceeds that found in typical active force units. As was noted in Sec. II, 50 percent of the aircraft maintenance work force in active squadrons has less than three years of experience; the comparable ARF figure is 10 percent. ARF pilots average about 50 percent more total flying hours than their active counterparts (see Table 5). Although this average is heavily influenced by the presence of the airlift pilot group, even the ARF fighter pilots exceed the flying-hour average of active fighter pilots by about 15 percent. ARF crews seem to acquit themselves ably in the periodic USAF competitive meets, which include teams from both the active and ARF sides of the establishment. And, of course, their performance in past mobilizations has been exemplary.

If we examine the capability and readiness records of ARF units, revealed by periodic inspections, we find that aside from those undergoing conversion the units consistently receive satisfactory scores on their Unit Capability Measurement System (UCMS) and operational readiness inspection (ORI) evaluations. The proportions of operationally ready aircraft and mission-ready crews are at generally high levels. For example, in 1975 the pass rate of ARF units in the readiness inspections exceeded 95 percent. However, by 1976, force modernizations were reducing these levels temporarily, as indicated in Table 14.

Table 14

ARF READINESS RATINGS
(As of January 1976)

REDCON Rating	USAFR	ANG
C-1	33	42
C-2	15	15
C-3	2	8
C-4	2	21
Not rated	1	5
Total	53	91

SOURCE: Ref. 14, p. 1340.

In the readiness condition rating system, C-1 signifies fully combat-ready, C-2 is "substantially" ready (with minor deficiencies), C-3 is "marginally" ready (with major deficiencies), and C-4 is not mission-capable. The USAFR's two C-4 units were in the process of converting to WC-130s and AC-130s, but were programmed to regain their previous combat-ready status by the spring of 1976. Seventeen of the 21 ANG units in the C-4 category were also in the conversion process, 2 had aircrew training deficiencies, and the remaining 2 were grounded for aircraft structural fatigue inspections. Of the 17 units in conversion, the ANG was anticipating C-3 or better for 10 of the units by the end of calendar year 1976.

TAC has adopted the more comprehensive UCMS ratings for grading the ARF units it is scheduled to gain in wartime. As was observed in the above readiness condition rating system, in 1976 the overall unit readiness ratings dipped temporarily as several of the USAFR units began to convert to newer aircraft. By the end of the year, however, most had completed the conversion and had demonstrated a satisfactory military capability in newer, more sophisticated aircraft models. Table 15 shows pertinent statistics on readiness and capability from the summary of TAC and MAC reports of ARF readiness.[15-16] Since ratings in aircraft models still in the active force's inventory of first-line aircraft are more pertinent to the question of ARF's ability to operate and maintain today's advanced and complex equipment, a more detailed breakout of these readiness reports is shown in Tables 16 and 17 for A-7s, RF-4Cs, C-130s, and for the lone F-4 unit presently operated by the ARF. Taken together, these readiness measures suggest that the ARF units are handling their missions with a high degree of competence. However, still unanswered is the question raised earlier concerning their performance compared to their active counterparts. To fully and adequately address the question of relative active force and ARF military capability, it would be necessary to make an extensive series of comparisons of paired active and ARF units flying the same aircraft models. All of the aircraft models common to both groups would have to be represented and the time frame would have to be sufficiently long to avoid biased results caused by temporary aberrations that do not truly reflect the long-term capabilities of the units being evaluated. Unfortunately, at the time of our main data-gathering effort (1975), the number of aircraft models common to both the active and reserve forces were few. Moreover, by the time this phase of the study was reached, it was clear that such a thorough evaluation was beyond the time and resources programmed for the study. As a consequence, our charter was revised to emphasize *methodology* for undertaking such an evaluation and compiling information regarding ARF capabilities and shortcomings that would be useful to Air Force planners charged with developing the preferred active/ARF force mix. Our attempt to satisfy these goals is described below.

Table 15

STATUS OF ANG/USAFR TACTICAL AND AIRLIFT FORCES

(As of the end of CY 1976)

Aircraft Type	No. of Units	Aircrews				Aircraft				Inspections[b]			
										ORI		MEI[c]	
		No. Auth.	No. Formed	No. CR	% CR[a]	No. Auth.	No. Poss.	No. CR	% CR[a]	No.	No. Sat.[d]	No.	No. Sat.[d]
ANG units													
A-7	6	157	137	125	91	132	144	110	76	6	6	6	6
A-37	2	60	49	46	94	48	48	35	73	2	2	2	2
C-130	17	240	210	146	70	142	146	87	60	10	10	4	4
F-4	1	23	20	19	95	18	16	9	56	1	1	1	1
F-100	16	431	391	358	92	342	353	283	80	15	15	16	15
F-105	3	85	69	65	94	68	63	41	65	3	3	3	3
RF-4	7	161	130	116	89	126	128	83	65	5	4	5	4
RF-101	1	23	21	17	81	18	21	15	71	1	1	1	1
EC-121	1	16	15	13	87	8	9	7	78	1	1	1	1
O-2	7	196	182	150	82	126	137	121	88	7	7	7	7
HC-130/ HH-3E	2	28	18	16	89	20	14	7	50	1	1	0	0
C-7	1	24	19	15	79	16	16	15	94	1	1	1	1
USAFR Units													
A-37	4	113	107	100	93	84	79	69	87	4	4	4	4
F-105	3	83	84	79	94	66	59	55	93	3	3	3	3
CH-3	1	9	7	7	100	6	6	5	83	1	1	1	1
AC-130B	1	20	12	8	67	10	9	4	44	1	1	1	1
C-130	12	184	146	137	94	112	125	86	69	8	7	8	8
WC-130	1	14	6	6	100	7	5	5	100	1	1	1	1
HC-130	2	18	15	13	87	12	12	12	100	2	2	0	0
HH-1H/ HH-3E	2	12	10	9	90	24	22	18	82	2	2	0	0
C-7	2	48	44	44	100	32	30	27	90	1	1	2	2
C-123	4	96	78	73	94	64	41	35	85	4	4	4	4
C-9[e]	1	17	15	11	73	--	--	--	--	(f)	(f)	(f)	(f)
C-5[e]	4	88	63	59	94	--	--	--	--	(f)	(f)	(f)	(f)
C-141[e]	13	416	273	268	98	--	--	--	--	(f)	(f)	(f)	(f)

SOURCES: Refs. 15 and 16.

[a]Percent of formed crews and possessed aircraft that are combat-ready.

[b]Inspections during CY 1976.

[c]Management Effectiveness Inspection.

[d]Satisfactory.

[e]Associate units.

[f]Not reported.

Table 16

STATUS OF ANG F-4, RF-4C, AND A-7D UNITS

(As of the end of CYs 1975 and 1976)

Unit/Location	% of Auth. Personnel Assigned[a]	Aircrew			Aircraft				Inspections[d]				UCMS Rating of Overall Capability[f]
									ORI		MEI		
		No. Auth.	No. Formed	No. CR[b]	No. Auth.	No. Assigned	No. CR[b]	% Flyable[c]	Month/ year	Result[e]	Month/ year	Result[d]	
F-4													
183 TFG Springfield, Ill.													
End CY 1976	90	23	20	19	18	20	9	41	1/76	Sat.	1/76	Sat.	83
End CY 1975	94	23	16	12	18	18	9	60	--	--	--	--	56
RF-4C													
End CY 1976													
117 TRW[g] Birmingham, Ala.	96	23	21	18	18	20	13	68	--	--	--	--	87
124 TRG Boise, Idaho	94	23	19	16	18	19	10	43	--	--	--	--	55*
148 TRG Duluth, Minn.	90	23	21	17	18	20	12	37	--	--	--	--	66*
152 TRG Reno, Nev.	80	23	16	16	18	20	10	43	10/76	Sat.	10/76	Sat.	55
155 TRG Lincoln, Nebr.	89	23	19	17	18	19	16	59	3/76	Sat.	3/76	Sat.	78
123 TRW[g] Louisville, Ky.	93	23	16	15	18	18	9	31	12/76	Min. sat.[h]	12/76	Unsat.	50*
187 TRG Montgomery, Ala.	93	23	18	17	18	19	13	60	9/76	Sat.	9/76	Sat.	85
End CY 1975													
117 TRW	99	23	22	19	18	20	17	65	12/75	Sat.	12/75	Sat.	96
152 TRG	83	23	10	2	18	20	0	17	--	--	12/75	Sat.	9*
155 TRG	96	23	19	16	18	19	10	56	--	--	1/75	Sat.	78
187 TRG	100	23	20	20	18	19	12	56	5/75	Sat.	5/75	Sat.	94

Table 16--Continued

Unit/Location	% of Auth. Personnel Assigned[a]	Aircrew			Aircraft				Inspections[d]				UCMS Rating of Overall Capability[f]
									ORI		MEI		
		No. Auth.	No. Formed	No. CR[b]	No. Auth.	No. Assigned	No. CR[b]	% Flyable[c]	Month/ year	Result[e]	Month/ year	Result[d]	
A-7D													
End CY 1976													
112 TFG, Pittsburgh, Pa.	89	23	18	18	18	20	14	65	10/76	Sat.	10/76	Sat.	77
140 TFW[g] Denver, Colo.	92	23	21	19	18	21	18	72	8/76	Sat.	8/76	Sat.	90
150 TFG Kirtland AFB, N. Mex.	93	30	25	25	24	27	21	60	5/76	Sat.	5/76	Sat.	85
156 TFG San Juan, P.R.	115	23	21	15	18	19	15	70	11/76	Sat.	11/76	Sat.	83*
121 TFW[g] Rickenbacker AFB, Ohio	90	23	18	15	18	21	13	50	11/76	Sat.	11/76	Sat.	72
169 TFG Eastover, S. C.	89	23	22	22	18	22	17	56	6/76	Sat.	6/76	Sat.	88
End CY 1975													
112 TFG	97	23	22	0	18	17	17	30	--	--	--	--	0*
140 TFW	94	23	20	18	18	20	14	53	5/75	Sat.	5/75	Sat.	78
150 TFG	91	30	29	27	24	26	13	46	5/75	Sat.	--	--	54
121 TFW	101	25	22	21	18	20	10	71	8/75	Sat.	8/75	Sat.	56
169 TFG	97	23	23	15	18	19	6	50	--	--	--	--	33*

NOTE: TFG (tactical fighter group), TRW (tactical reconnaissance wing), TRG (tactical reconnaissance group), TFW (tactical fighter wing).

[a]TAC-gained personnel (excludes some support personnel).

[b]Combat-ready.

[c]Percent of assigned.

[d]Dashes in columns indicate that there were no inspections that year.

[e]Satisfactory/unsatisfactory.

[f]Asterisk indicates aircraft received in that year.

[g]Wing headquarters and collocated units only.

[h]Minimum satisfactory.

Table 17

STATUS OF USAFR/ANG C-130 UNITS

(As of the end of CYs 1975 and 1976)

Unit/Location	% of Auth. Personnel Assigned[a]	Aircrew			Aircraft			Inspections[c]				
								ORI		MEI		
		No. Auth.	No. Formed	No. OR[b]	No. and Type Auth.	No. Assigned	No. OR[b]	Month/ year	Result[d]	Month/ year	Result[d]	REDCON C-Status[e]
End of CY 1976												
Air Force Reserve												
459 TAW[f] Andrews AFB, Md.	101.0	16	14	13	8/C-130E	8	6	2/76	Sat.	2/76	Sat.	C-1
924 TAG Bergstrom AFB, Tex.	95.7	12	7	6	8/C-130B	9	5	9/76	Sat.	9/76	Sat.	C-3
928 TAG Chicago O/Hare International Airport, Ill.	106.7	12	12	10	8/C-130A	9	4	--	--	--	--	C-3
440 TAW[f] Gen. Billy Mitchell Field, Wis.	103.3	12	11	10	8/C-130A	8	5	3/76	Sat.	3/76	Sat.	C-2
433 TAW[f] Kelly AFB, Tex.	99.5	24	15	15	16/C-130B	17	16	9/76	Sat.	9/76	Sat.	C-1
934 TAG Minneapolis-St. Paul International Airport, Minn.	102.0	12	12	12	8/C-130A	8	4	--	--	--	--	C-3
926 TAG New Orleans Naval Air Station, La.	97.4	12	9	9	8/C-130B	10	8	--	--	7/76	Sat.	C-1
914 TAG International Airport, Niagara Falls, N.Y.	106.3	12	12	12	8/C-130A	9	4	1/76	Sat.	1/76	Sat.	C-3
442 TAW[f] Richards-Gebaur AFB, Mo.	87.8	32	19	17	16/C-130E	16	14	1/77	Sat.	--	--	C-3
403 TAW[f] Selfridge ANG Base, Mich.	100.2	12	11	11	8/C-130A	12	6	4/76	Marg. sat.[g]	4/76	Sat.	C-2
439 TAW[h] Westover AFB, Mass.	97.3	12	11	11	8/C-130B	11	8	5/76	Sat.	5/76	Sat.	C-1
913 TAG Willow Grove Naval Air Station, Pa.	102.2	16	13	11	8/C-130E	8	6	--	--	--	--	C-2

Table 17--Continued

Unit/Location	% of Auth. Personnel Assigned[a]	Aircrew			Aircraft			Inspections[c]				
								ORI		MEI		
		No. Auth.	No. Formed	No. OR[b]	No. and Type Auth.	No. Assigned	No. OR[b]	Month/ year	Result[d]	Month/ year	Result[d]	REDCON C-Status[e]
Air National Guard												
172 TAG A. C. Thompson Field, Miss.	97.1	16	15	14	8/C-130E	8	6	8/76	Sat.	8/76	Sat.	C-1
153 TAG Cheyenne Municipal Airport, Wyo.	93.0	12	11	11	8/C-130B	9	8	--	--	--	--	C-1
145 TAG Douglas Municipal Airport, N.C.	107.4	12	11	11	8/C-130B	9	8	11/76	Sat.	11/76	Sat.	C-1
167 TAG Eastern West Virginia Airport, W. Va.	98.3	12	12	8	8/C-130B	8	8	12/76	Sat.	2/76	Sat.	C-3
166 TAG Greater Wilmington Airport, Del.	100.8	12	12	3	8/C-130A	8	4	--	--	--	--	C-2
130 TAG Kanawha County Airport, W. Va.	96.9	16	14	0	8/C-130E	8	0	--	--	9/76	Sat.	C-4*
176 TAG Kulis ANG Base, Alaska	76.4	16	8	0	8/C-130E	8	6	--	--	--	--	C-4*
179 TAG Mansfield-Lahm Municipal Airport, Ohio	95.5	12	6	4	8/C-130B	8	3	--	--	--	--	C-4*
164 TAG Memphis Metropolitan Airport, Tenn.	100.3	12	12	10	8/C-130A	8	5	4/76	Sat.	--	--	C-2
133 TAW[f] Minneapolis-St. Paul International Airport, Minn.	102.9	12	12	12	8/C-130A	9	4	--	--	--	--	C-3
118 TAW[f] Nashville Metropolitan Airport, Tenn.	92.7	12	12	10	8/C-130A	8	6	3/76	Sat.	3/76	Sat.	C-3

Table 17--Continued

Unit/Location	% of Auth. Personnel Assigned[a]	Aircrew			Aircraft			Inspections[c]				REDCON C-Status
								ORI		MEI		
		No. Auth.	No. Formed	No. OR[b]	No. and Type Auth.	No. Assigned	No. OR[b]	Month/ year	Result[d]	Month/ year	Result[d]	
Air National Guard (cont.)												
139 TAG Rosecrans Memorial Airport, Mo.	95.2	12	12	0	8/C-130A	8	2	--	--	--	--	C-4
165 TAG Savannah Municipal Airport, Ga.	105.3	16	16	14	8/C-130E	8	7	4/76	Sat.	--	--	C-1
109 TAG Schenectady County Airport, N.Y.	89.8	12	9	9	8/C-130D	9	4	3/76	Sat.	--	--	C-3
143 TAG T.F. Green Municipal Airport, R.I.	89.9	12	8	3	8/C-130A	7	4	7/76	Sat.	--	--	C-4
146 TAW[f] Van Nuys Airport, Calif.	105.3	16	13	10	6/C-130B	7	4	--	--	--	--	C-2
		16	16	16	8/C-130E	8	5	--	--	--	--	
137 TAW[f] Will Rogers World Airport, Okla.	104.0	12	11	11	8/C-130A	8	4	--	--	12/76	Sat.	C-4
End CY 1975												
Air Force Reserve												
459 TAW[f]	103.3	12	14	13	8/C-130B	8	7	8/74	Sat.	8/74	Sat.	C-1
924 TAG, Ellington, Tex.	100.6	12	10	10	8/C-130A	8	8	8/74	Sat.	8/74	Sat.	C-1
928 TAG	105.6	12	12	12	8/C-130A	8	7	11/75	Sat.	11/75	Sat.	C-1
440 TAW[f]	100.7	12	11	11	8/C-130A	8	5	11/74	Sat.	11/74	Sat.	C-2
433 TAW[g]	100.6	24	22	21	16/C-130B	18	12	3/75	Sat.	1/74	Sat.	C-1
934 TAG	105.2	12	13	11	8/C-130A	8	7	6/75	Sat.	6/75	Sat.	C-1
926 TAG	104.6	12	10	10	8/C-130B	8	6	3/75	Sat.	3/75	Sat.	C-1
914 TAG	107.0	12	11	11	8/C-130A	8	8	4/74	Sat.	4/75	Sat.	C-1
442 TAW[f]	101.6	32	22	20	16/C-130E	14	13	9/75	Sat.	9/75	Sat.	C-2
403 TAW[f]	107.1	12	10	8	8/C-130A	8	7	11/74	Sat.	11/74	Sat.	C-1
439 TAW[h]	99.4	12	10	10	8/C-130B	9	6	12/74	Sat.	12/74	Sat.	C-1
913 TAG	105.8	12	11	10	8/C-130A	8	8	1/75	Sat.	1/75	Sat.	C-1
920 TAG, Keesler, Miss.	102.9	12	9	7	8/C-130B	9	7	6/75	Sat.	6/75	Sat.	C-2
452 TAW[f], Hamilton, Calif.	94.0	12	10	9	8/C-130B	8	6	10/74	Sat.	10/74	Sat.	C-2
940 TAG, McClellan, Calif.	101.3	12	13	12	8/C-130B	8	6	--	--	1/75	Sat.	C-1

Table 17--Continued

Unit/Location	% of Auth. Personnel Assigned[a]	Aircrew			Aircraft			Inspections[c]				REDCON C-Status
								ORI		MEI		
		No. Auth.	No. Formed	No. OR[b]	No. and Type Auth.	No. Assigned	No. OR[b]	Month/ year	Result[d]	Month/ year	Result[d]	
Air National Guard												
172 TAG	102.4	16	15	14	8/C-130E	8	6	4/75	Sat.	4/75	Sat.	C-1
153 TAG	99.5	12	11	10	6/C-130B	6	6	10/75	Sat.	10/75	Sat.	C-2
145 TAG	110.8	12	11	11	6/C-130B	6	6	6/75	Sat.	6/75	Sat.	C-1
167 TAG	100.7	12	12	11	8/C-130A	8	5	3/74	Sat.	3/74	Sat.	C-2
166 TAG	99.1	12	11	10	8/C-130A	11	8	9/75	Sat.	9/75	Sat.	C-1
164 TAG	99.0	12	12	9	8/C-130A	9	8	12/73	Sat.	12/73	Sat.	C-4
133 TAW[f]	94.0	12	12	12	8/C-130A	10	4	10/75	Sat.	10/75	Sat.	C-2
118 TAW[f]	98.7	12	12	12	8/C-130A	9	6	4/75	Sat.	2/75	Sat.	C-1
165 TAG	111.6	16	16	10	8/C-130B	7	7	--	--	9/74	Sat.	C-4
109 TAG	91.8	12	10	10	8/C-130D	9	5	9/74	Sat.	9/74	Sat.	C-1
143 TAG	88.7	12	9	0	9/C-130A	1	1	--	--	--	--	C-4*
146 TAW[f]	98.7	16	10	6	6/C-130B	6	3	5/75	Sat.	5/75	Sat.	C-1
		16	16	16	8/C-130E	8	6	--	--	--	--	--
137 TAW[f]	99.6	12	12	8	8/C-130A	8	7	9/74	Sat.	9/74	Sat.	C-4*

SOURCE: Ref. 16.

NOTE: TAW (tactical airlift wing), TAG (tactical airlift group).

[a]MAC-gained personnel only (excludes some support personnel).

[b]Number operationally ready.

[c]Dashes in columns indicate that there were no inspections that year.

[d]Satisfactory/unsatisfactory.

[e]Readiness Condition Policy (asterisk indicates aircraft received in that year).

[f]Wing headquarters and collocated units only.

[g]Marginally satisfactory.

[h]439 TAW has both C-130 and C-123 elements. Except for "% of Auth. Personnel Assigned," statistics are for C-130 elements.

First of all it is apparent that ARF flying units exhibit several sorts of wartime capability differences that must be taken into account by Air Force planners in their force mix deliberations. Of primary importance is the fact that ARF units are inherently *less available* than active units* in that the decision to mobilize them requires consideration of the effect on: (1) the Congress; (2) allies and adversaries; (3) the economic well-being of the communities from which reservists are withdrawn; and (4) the ability of reserve units to attract and hold quality manpower resources in the long term.

Of secondary importance and a result of a deliberate policy is that reserve crews typically fly fewer hours and attain proficiency in fewer phases of an aircraft's designed operational capability (DOC) than do active crews. In some cases the training differences are slight, and the reduced capability may be of minor importance. For example, it may be desirable to have all fighter units capable of conducting tactical nuclear operations, but the absence of such capability in a portion of the force may be of small consequence.

Fully recognizing these important limitations of ARF units, we have examined the following question: Given that the decision to mobilize has been made and implemented, *within the range of wartime missions for which ARF units are tasked,* are there significant recognizable differences between similarly equipped and similarly constituted active and ARF units that need be taken into consideration by planners who structure the total force mix?

The three case studies address that question in the mission areas of fighter/attack (A-7), tactical airlift (C-130), and reconnaissance (RF-4C). For want of actual wartime observations of the effectiveness of active and reserve units in carrying out their assigned combat missions, we examine a wide range of peacetime performance measures, identify the apparent differences between active duty personnel and reservists, and then infer how these differences may affect potential

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*Martin Binkin refers to the "inordinately high 'potential costs' and dramatic consequences associated with mobilizing citizen-soldiers in a democratic society [which] makes them particularly useful as an instrument for signifying resolve." See Ref. 17, p. 20.

combat effectiveness. For example, were we to find that deficiencies in a given reserve unit during a peacetime exercise caused it to generate 20 percent fewer sorties than a comparable active unit, this would be indicative of a potential shortcoming of the reserve unit in wartime, at least initially. Similarly, a finding that the skill level of a reserve unit's manning is 25 percent lower than that of its active counterpart, or that its bombing accuracy is 10 percent higher would permit some inferences to be made concerning their relative potential capabilities. Although these inferences are not precise, illumination of such quantitative differences, to the extent that they exist, permits a more refined qualitative assessment of comparative capability. Furthermore, identification of relative shortcomings will provide awareness of specific areas in which improvements in capability may be effected. Any additional costs involved in overcoming these shortcomings, if it is feasible to do so, can then be considered in the comparison.

Comparisons were conducted over two broad areas: mobility preparedness and mission capability. Within each we identified the principal components and specified their metrics. It was necessary to use some measures that do not yield direct comparisons of capability and, in some instances, to use measures that are essentially descriptive. In assessing the relative capabilities of similarly equipped active and reserve units, we define or describe each capability component and present its measures with as much precision as the data allow; our evaluation of the differences in capability include the gaining command's assessment as well as our own.

For a military capability comparison to be meaningful, it is important to select active and ARF units that fairly represent the characteristics of (1) active and reserve forces in general, and (2) the group of units that operate the particular aircraft type being evaluated. However, the active wings selected for our case studies contained some squadrons whose personnel were not completely qualified in the aircraft, which might appear to bias the results against the active units. Actually if we had limited the evaluation to only those units that were 100 percent qualified, one of the active force's primary characteristics

would not be reflected--the existence of large numbers of inexperienced personnel in CONUS-based wings as a constant state, due to personnel turnover and changes in mission assignments. Thus, in attempting to evaluate such measures as the number of combat-ready crews that an active TAC wing, for example, can muster for its total number of assigned aircraft, it is not inappropriate to analyze a wing that has either a replacement training squadron, or a squadron in the process of conversion. Since ORIs exclude such squadrons, those measures tend to overstate the wing's overall capability to some extent.

Our limited case study comparisons are not, of course, intended to provide a definitive statement regarding the potential wartime output of either the active or reserve units in absolute terms--even a more comprehensive series of comparisons probably could not attain that goal--but it will enable the planners to quantify the differences between the two kinds of units, thereby affording a basis for better judgments concerning the relative capability of reserve and active units. The data used for our comparisons were collected in mid-1975 and therefore include performance for the first part of that year. We have not updated all of the numbers because the purpose was not to make an absolute determination of existing capability of any unit, but rather to devise an approach for making comparisons between active and ARF units.

COMPARISON OF A-7 UNITS

For purposes of comparison we selected the USAF's 23d TFW, England AFB, Louisiana, and the ANG's 140th TFW, Buckley Air National Guard Base, Colorado. The 23d TFW consists of three fighter squadrons--the 74th, 75th, and 76th--of which two had Rapid Reactor mobility missions.* The 140th TFW had one collocated squadron, the 120th TFS, and was the nominal parent of two other units--the 150th TFG, Kirtland AFB, New

*The 75th TFS was converted to a Rapid Reaction squadron on 1 July 1975. Data used in this comparison were collected before that date. Rapid Reaction forces are CONUS-based USAF units earmarked for rapid augmentation of NATO in the event of war (see Ref. 18).

Mexico, also equipped with A-7s, and the 149th TFG, Kelly AFB, Texas, equipped with F-100s. The 149th and 150th TFGs are not included in this comparison: resource measures pertain to the 140th TFW component at Buckley ANG Base; flying activity measures pertain to the collocated 120th TFS.

Active and ANG A-7 units differed in organization and manning. The active unit, with a total of 72 UE aircraft, consisted of the complete wing/base organizational components. The ANG unit had only 18 UE aircraft, and was organized into the wing headquarters, one fighter squadron, one consolidated aircraft maintenance squadron, and other supporting units. Manning totals, including full support, are shown in Table 18.

Table 18

MILITARY MANPOWER AUTHORIZATIONS FOR THE 23d TFW (USAF) AND THE 140th TFW (ANG)

(As of the end of FY 1975)

Element	23d TFW Manpower			140th TFW Manpower		
	No. Auth.	% of Total	No. per UE	No. Auth.	% of Total	No. per UE
Wing	312	11.6	4.3	52[a]	5.8	2.9
Fighter squadron(s)	123	4.5	1.7	41[b]	4.6	2.3
Maintenance	1100	40.7	15.3	314	35.3	17.4
Support	1167	43.2	16.2	483	54.3	26.8
Total	2702	100.0	37.5	890	100.0	49.4

SOURCES: Refs. 5 and 19.

[a]Pro rata share.

[b]120th TFS only.

Manning per UE aircraft was higher in the ANG unit primarily because of greater proportionate authorizations in support functions; in mission-related functions, the manning to UE ratios were quite similar. The more favorable support manpower ratio of the active unit probably reflects the scale economies of operating a large wing base compared with the much smaller ANG operation.

Mobility Readiness

Plans. Both active and ANG units must satisfy mobility requirements as stated in Air Force Manual 28-40[20] and TAC Manual 400-1.[21] Both units also have plans and procedures to insure that they can generate and deploy force packages within the time frames established in COMTAC Force Generation Publication 200.[22] These packages can vary in size and deployment duration, and are further defined by unit type code designation in the USAF *War and Mobilization Plan*.[18]

Both units in our comparison had acceptable mobility plans. The plans of the 23d TFW (USAF) had been reviewed and approved by the Tactical Air Command (TAC), and those of the 140th TFW (ANG) had been reviewed and approved by its advisor wing (355th TFW), Twelfth Air Force, and the National Guard Bureau. All other ANG A-7 units have similar plans.

Each plan provides for the alerting and assembly of unit personnel and the activation of the unit mobility control center within the specified times. Both units periodically exercised their recall and management procedures and were recently evaluated by Inspector General (IG) teams on all aspects of their mobility capabilities. The IG teams apparently found that under contingency and recall conditions, units planned for deployment could probably be activated and deployed as required. Both units could probably generate the required aircraft with sufficient warning; even under no-warning conditions, the units had sufficient back-up crews in the squadron/group/wing staffs and could, if necessary, call on other TAC resources to supplement deficiencies. It appears that there was little difference between the units in this area.

OMI/MEI reports on both units showed them to be in accord with TAC mobility training and readiness criteria. Commanders' assessments of mobility showed that all units were currently deficient in war readiness spares kits but otherwise satisfactory.

The 23d TFW (USAF) had deployed aircraft and personnel from England AFB ten times during the year, in some instances outside the CONUS. The 120th TFS (ANG) of the 140th TFW had conducted no such deployments;

even their two-week active duty training was accomplished at their home station.*

Mobility Exercises. Mobility evaluations during ORI/MEI activities were also more limited in the case of the 140th TFW (ANG). Such inspections, given with 30 days' notice, were conducted during a monthly UTA period. Since a single squadron had only one set of ground support equipment, mobility exercises were confined to one day so that scheduled flying could be accomplished during the UTA. As a consequence, only 35 percent of the mobility equipment was marshaled and spotted on the loading ramp. During ORIs at the 23d TFW (USAF), all mobility packages were marshaled and some were actually loaded into MAC aircraft. The active unit's ORI covered an 8 day period; no prior notice was given. During any given year, the active unit will also practice loadings into MAC aircraft to maintain unit readiness; the reserve unit will not.

The ability of the active wing to quickly generate one or two complete squadron packages was probably higher, since it could draw operationally ready aircraft from a larger immediate pool. The active wings could not, however, generate a third squadron or draw on the aircraft that were not operationally ready any faster than the reserves could, if the "A" and "B" mobility packages had depleted the active wing of experienced maintenance personnel. It should be recognized that the reserve unit, when federalized, can draw on USAF-wide assets for filling deficiencies, just as the active wing can, and will probably be able to close and operate on the same time scale as the active unit.

Unit Capability Measurement System. UCMS is the standard USAF management information system that is designed to assess a combat unit's capability to perform its assigned missions. UCMS is based on the unit commander's evaluation (both subjective and objective) of his unit's readiness in terms of a standard set of key measures. Reports are required each 24 hours for USAF units, twice monthly for ANG units, and monthly for USAFR units. Each report deals with the unit's ability

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*This is not the usual experience. ARF fighter units typically engage in summer encampments as well as JCS training exercises away from the home station.

to sustain combat operations for 30 days under the assumption that the resources available at the time of the report remain constant throughout the projected 30 days.

Table 19 shows the active and reserve UCMS ratings averaged over seven and four months, respectively,* through July 1975.

Table 19

UCMS MEAN SCORES[a] FOR THE 23d TFW (USAF) AND THE 140th TFW (ANG)

(Through July 1975)

Readiness Measure	23d TFW[b]	140th TFW[c]
Equipment	86	77
Crews	93	95
Personnel	93	91
Overall	80	77

SOURCE: Ref. 23.

[a]UCMS ratings are based on a scale presented in Ref. 24. The numbers are not direct percentages of authorized or available personnel or equipment.

[b]Excludes the 75th TFS, which was in training and conversion.

[c]Buckley ANGB units only.

The scores were comparable in all respects. The three percentage point difference in the overall rating resulted entirely from the ANG's lower equipment rating, which we would expect, as a result of their somewhat lower supply priority. On the basis of these data, we observed little apparent difference between the 23d TFW and the 140th TFW.

Employment Capability

The capability of a unit to perform its intended wartime mission,

*These are the full periods that UCMS had been in operation for USAF and ANG units as of July 1975.

once deployed, is probably reflected in the degree to which peacetime training and proficiency goals have been achieved. The mission-ready and mission-capable semiannual proficiency standards are shown in Table 20.

Table 20

SEMIANNUAL TRAINING SORTIES REQUIRED FOR MISSION-READY AND MISSION-CAPABLE A-7 AIRCREWS

	Mission-Ready (Line)		Mission-Capable (Line)		Mission-Capable (Staff)	
	USAF	ANG[a]	USAF	ANG[a]	USAF	ANG[a]
Air/ground DOC	59	42	44	36	38	32
Mission support	10	6	10	6	10	6
Total	69	48	54	42	48	38

SOURCE: Ref. 25.

[a]ANG standards are day only.

ANG units, which were designated for day-only proficiency, are authorized fewer sorties than the active units, a difference for each pilot of about three sorties per month (i.e., 69 sorties versus 48 sorties per six months). However, because of abnormally high training loads* and flying-hour restrictions in the active forces, the difference between the units was less than the standards may indicate: the active unit's operational target was to maintain primary mission pilots somewhere between "mission-capable" and "mission-ready," depending upon individual skill and experience. Thus, on average, the expected difference between USAF and ANG units was about two sorties per month per pilot. Since the event content of each sortie, whether USAF or ANG, must meet the overall requirements of TACM 51-7,[25] and the general standards of AFR 60-1[26] and AFR 55-89,[27] pilots who are between

*At the time of the study, a large number of unassigned A-7 pilots were attached to the 23d TFW for flying training support.

"capable" and "ready" in either unit are approximately equally proficient in the events they are called upon to perform.*

Pilot Experience Levels. The experience level of assigned pilots is probably an important factor worth considering in comparing active and ANG unit capability. Table 21 shows the average flying time, combat time, and A-7 experience for the entire USAF and ANG A-7 force, as well as for the units being compared.

Table 21

USAF AND ANG A-7 PILOTS' AVERAGE FLYING EXPERIENCE
(As of April 15, 1975)

Type of Flying Experience	No. of Flying Hours			
	USAF		ANG	
	Overall	23d TFW	Overall	140th TFW[a]
Total	1690	1508	2724	2547
Combat	295	288	240	256
A-7	425	341	102	92

SOURCE: Air Force Inspection and Safety Center.

[a]Buckley ANGB units only.

The ANG pilots had greater average total experience but less A-7 experience than those in the USAF. Although ANG pilots fly fewer hours than active unit pilots, the ANG's significantly lower turnover of pilots suggests that their average A-7 experience will ultimately surpass that of USAF pilots. One experience factor that was not revealed in these averages was the *distribution* of experience across the pilot force. Based upon TAC-DOO RCS 7203 (T-33)[28] criteria for "experienced"

*ANG unit commanders felt that their pilots could become fully DOC qualified (including night gunnery) without significant additional flying-hour allocations. They said that their pilots required only night flare facilities at the target ranges and some additional training for initial qualification--approximately four sorties plus three classroom hours per pilot.

and "nonexperienced" pilots, we found that 48 percent of pilots in the USAF's 23d TFW were "experienced," and 81 percent of those in the ANG wing's 120th TFS were "experienced."* This reflected the large numbers of recently graduated pilots typically found in active units, compared with the small number in reserve units. The active wing had relatively large numbers of inexperienced pilots on the line; the pilots with the greatest number of flying hours were on the wing and squadron staffs.†

Mission-Ready Crews. Another important current measure of unit capability was the mission-ready status of assigned crews, shown in Table 22.

Table 22

AVERAGE MISSION-READY STATUS OF LINE PILOTS IN THE 23d TFW (USAF) AND 140th TFW (ANG)

(January-April 1975)

Status	23d TFW	140th TFW[a]
Authorized	72[b]	23
Assigned	84	23
Mission-ready	64	19
Mission-ready ÷ assigned	76%	83%

SOURCES: Refs. 28 and 29.

[a]120th TFS only.

[b]The 75th TFS lacked a full authorization of pilots.

From these data it appeared that both units could man all UE aircraft with mission-ready crews. Active crews had the experience of theater deployments and exercises, whereas the reserve unit had yet to

*Pilots "experienced" in tactical attack, fighter, and reconnaissance aircraft have at least 1000 total pilot hours in those aircraft and 500 hours as first pilot and/or instructor pilot in the assigned type aircraft (see Refs. 8 and 31).

†As expected, we found that the average age of the pilots is higher in the ANG (35) than in the USAF (31).

exercise its equipment outside the CONUS. The reserve crews may have flown other aircraft overseas in previous years, however, since overseas deployment exercises are performed routinely by reserve units.

Flying Activity/Performance. There was a significant difference between the units in the intensity of flying activity, as shown in Table 23.

Table 23

FLYING ACTIVITY IN THE 23d TFW (USAF)
AND THE 140th TFW (ANG)
(January-April 1975)

Item	23d TFW	140th TFW[a]
Authorized UE	72	18
Average possessed UE	66.5	17.3
Sorties per month	951	226
Sorties per UE per day[b]	0.65	0.59
Flying hours per month	1696	352
Flying hours per possessed UE per month	25.5	20.4

SOURCES: Refs. 30 and 31.

[a]120th TFS only.

[b]Based on 22 flying days per month.

The 23d TFW (USAF) generated about 10 percent more sorties (and 25 percent more flying hours) per UE than the 120th TFS. This higher activity level in the active unit clearly required more intense effort and closer scheduling, and the active unit's problems were compounded during this period by relatively poorer weather as well as deployment cancellations. The effects of more intensive operations may be reflected in the ground and air abort rates over the same five months: 23d TFW (USAF), 3.8 percent; 120th TFS (ANG), 2.6 percent.

Another measure of fleet condition is the ability of the supporting resources to generate aircraft and meet the requirements of the flying program. Aircraft status reports for January through May 1975 show approximately comparable operationally ready (OR) rates for the two units, as revealed in Table 24.

Table 24

OPERATIONAL READINESS RATES

(January through May 1975)

Unit	OR (%)	Flyable[a] (%)
23rd TFW (USAF)	35.5	78.1
140th TFW[b] (ANG)	44.0	61.4

SOURCES: Refs. 30 and 31.

[a]Includes OR aircraft plus aircraft that can be safely flown despite being classed as NORM--not operationally ready (Maintenance)--or NORS--not operationally ready (supplies).

[b]120th TFS only.

In both cases the OR rates reflected an abnormally high NORS-G* condition relating to the propulsion system. It was interesting to note that, as mentioned earlier, although the supply priorities of the active unit were markedly higher than the ANG unit's, the latter's OR rate was as good (or better), despite the NORS-G problem. While this may be partially attributable to the "quality" of ANG maintenance (by repairing the parts rather than waiting for replacements), it was undoubtedly influenced by the ANG's lower activity rate, which gave them more time to maintain the fleet. This highlighted a fundamental difference between the units: The continued higher activity rate of active units will tend to drive down OR rates, and the ANG unit will probably possess a somewhat higher percent of OR aircraft at any point in time.

Maintenance. The ANG unit's maintenance work force and maintenance organization differed in several respects from those of the USAF unit. Most of the peacetime maintenance in the ANG unit was accomplished by 150 full-time Air Technicians during a regular Monday through Friday work week.† When mobilized, the ANG maintenance work force would

*Not operationally ready (supplies)-grounded.

†Typically about 70 percent of ANG flying is scheduled for Tuesday through Friday, and 30 percent for weekends, with the exception of the

consist primarily of this Technician cadre plus the part-timers, most of whom had some prior-service experience.

We selected three measures to compare maintenance quality/performance between the units: experience levels of the work force, direct maintenance man-hours per flying hour (DMMH/FH) expenditures, and the base self-sufficiency index.

As shown in Table 25, the experience level of the ANG unit was nearly eleven years, including the experience of both Technicians and part-timers. The Technicians alone averaged more than fourteen years experience. A significant difference between the units can be seen in

Table 25

MAINTENANCE MANNING AND EXPERIENCE LEVELS FOR THE 23d TFW (USAF) AND THE 140th TFW (ANG)

(As of May 1975)

Measure	23d TFW	140th TFW[a]
Authorized strength	1186	314
Assigned strength	1214	322
Assigned ÷ authorized	102%	103%
Average experience (years)	6.1	10.7

SOURCE: Personal communications from 23d TFW and 140th TFW.

[a]Buckley ANGB units only.

the *distribution* of experience levels: while the ANG work force consisted of approximately equal numbers of workers across the spectrum of experience levels, more than 55 percent of the 23d TFW (USAF) line maintenance personnel had three years or less experience.

The DMMH/FH ratio measures the relationship between flying hours and the number of direct maintenance man-hours they generate. During the four-month period of January-April 1975, the ANG unit appeared to have a 50 percent greater DMMH/FH factor than the active unit (29.2

UTA weekend when flying operations are usually curtailed to a great extent. Thus, the notion that the ANG is a force of "weekend warriors" no longer applies.

maintenance man-hours compared with 19.8, respectively). This was surprising in view of the significantly greater average experience level of the ANG maintenance force. Perhaps four months is too short a period to measure DMMH/FH because of possible variations in such factors as the urgency of aircraft sortie generation (repairs tend to be made more expeditiously during periods of intensive activity), the extent of deferred maintenance, and the amount of on-the-job training (OJT) given to inexperienced personnel. Extending the measurement period to a year would permit these influences to average out, but judgment would still be required to interpret the difference in active and reserve ratios because of possible differences in aircraft age and condition, and the length of time the compared units have had the aircraft. Of particular significance is the heavy weight that the reserve DMMH/FH ratio gives to the highly skilled Air Technician portion of the reserve maintenance force, since it is the cadre of Technicians that performs most of the aircraft maintenance in peacetime and, consequently, establishes the DMMH/FH. Thus the reserve DMMH/FH ratio tends to overstate the overall competence of the reserve maintenance force as a whole.

Given these qualifications, it is clear that the raw DMMH/FH ratios of active and reserve units are not strictly comparable and to be useful at all they must be subjected to careful interpretation.

The base self-sufficiency indices reflect the ability of the units to accomplish field and intermediate-level maintenance with their own resources; the 23d TFW scored 97 percent and the 140th TFW scored 99.5 percent. Both units appeared to be able to handle these tasks adequately although, like the DMMH/FH ratio, the ANG index may be somewhat inflated.

Accident Rates. Fleet-wide A-7 accident records for the past five years are shown in Table 26. While the yearly rates showed wide fluctuations, the overall rates were quite comparable between the USAF and ANG units.*

*Shortly after compiling these data we were advised of several additional active force accidents over a short period, which would probably make a significant change in this statistic. Complete flying-hour data were not available, so these accidents are not included.

Table 26

TOTAL A-7 ACCIDENT RECORDS: MAJOR AND MINOR

(Through May 1975)

Year	USAF			ANG		
	Hours Flown	No. of Accidents	Rate[a]	Hours Flown	No. of Accidents	Rate[a]
1971	37,094	5	13.5	0	0	0
1972	62,708	3	4.8	0	0	0
1973	88,130	10	11.4	29	0	0
1974	81,359	6	7.4	7,948	1	12.6
1975	29,425	2	6.8	5,611	0	0
Total	298,716	26	8.7	13,588	1	7.4

SOURCE: Air Force Inspection and Safety Center.

[a]Rate is accidents per 100,000 flying hours.

Operational Readiness Inspections. The periodic ORIs are particularly good, objective sources of information for comparing active and ARF unit readiness. Both units in our case study had recently completed ORIs, the principal results of which are tabulated in Table 27. We have combined the 23d TFW scores into a mean score for the two squadrons involved.* Because of the sensitive nature of the actual effectiveness figures, they were converted to a normalized index in which the ANG scores are given as a greater or lesser fraction of the active unit's scores. The table gives no indication as to the actual effectiveness figures; it reveals only the degree to which the ANG scores are better or worse than those of the active unit. For example, in a given event, the active unit might receive a score of 80, whereas the ANG unit might score an 88. In the normalized version, the active unit's score would be shown as "1.0" and the ANG unit's score would be shown as "1.1" because it is 10 percent better. If the ANG unit had scored a 72, the normalized scores would have been: active--1.0, ANG--0.9. The score of the active unit is always shown as "1.0"

*The 74th and 76th TFS. Recall that the 75th TFS was undergoing conversion at the time of this ORI.

Table 27

OPERATIONAL READINESS INSPECTIONS OF THE 23d TFW (USAF)
AND THE 140th TFW (ANG)

(March 1975 and May 1975, respectively)

Status/Events	Measure	23d TFW[a]	140th TFW[b]
Aircrews			
Formed	Percent of authorized	1.0	0.9
Mission-ready	Percent of formed	1.0	0.9
Munitions crews			
Formed	Percent of authorized	1.0	0.8
Certified	Percent of formed	1.0	1.2
Certified crews available	Percent of certified	1.0	0.9
Certified crews effective	Percent of those evaluated	1.0	1.3
Sorties flown	Percent of scheduled	1.0	1.0
Refuelings	Percent successful	1.0	1.0
Strike events			
Low-angle bomb	CEP	1.0	0.6
Low-angle drag	CEP	1.0	0.8
Dive bomb	CEP	1.0	1.1
Strafe	Percent effective	1.0	0.9
Weapons firing	Percent effective	1.0	1.0

[a]Scores are normalized. For this comparison the USAF scores are shown as 1.0 regardless of the actual value. The ANG scores are shown as a greater or lesser fraction of the USAF score. USAF data are for 74th TFS and 76th TFS.

[b]ANG data are for 120th TFS only.

and the ANG score establishes the comparative relationship between the active and reserve values.

The USAF unit was inspected by TAC and the ANG unit by Twelfth Air Force under identical standard criteria. The manner of inspection, however, differed in two respects: (1) the USAF unit ORI was conducted over eight consecutive days and the ANG unit ORI was conducted during a UTA weekend; (2) the USAF unit ORI was given without prior notice, whereas the ANG unit was given thirty days' notice. Although there is some disagreement about the implications of these different inspection conditions, most IG and standardization/evaluation personnel interviewed felt that the thirty days' notice probably would have a limited bearing, because the kinds of deficiencies generally exposed were those that could

not have been erased within thirty days. The shorter inspection period of two days at the ANG unit was also thought to be of small consequence, because the ANG unit is smaller than the USAF unit, and proportionately more inspectors were employed at the ANG unit.

In any case, to the extent that the ORI can be considered a fair comparison measure, we conclude that there is a significant comparability between the units in terms of readiness to accomplish the assigned mission. Although the active unit pilots produced better CEPs than the ANG crews in this inspection, both were within the standard.

Management Effectiveness Inspection. MEIs were conducted by TAC at the 23rd TFW (USAF) and by Twelfth Air Force at the 140th TFW (ANG) to evaluate all management and functional activities of both units under identical inspection criteria. Table 28 summarizes the results of these inspections, and includes a mean overall score for each area, devised by the authors by assigning numerical values as follows: laudatory comment = 3; minor deficiency = 2; major deficiency = 1.* The column labeled "N/A" is excluded from the computations of the mean scores.

On the basis of these MEIs, the units again appear to be quite comparable, with overall mean total scores of 1.8 and 1.9 for the USAF and ANG units, respectively. Aside from the observation that the ANG unit received proportionately fewer major deficiency evaluations (9 percent of the scored areas, compared to the active unit's 20 percent), these data reveal no pattern of significant differences between the units.

Summary

The foregoing discussion has included a wide and diverse range of measures compiled for purposes of comparing similarly equipped USAF and ARF A-7 units. All measures discussed in this section are summarized in Table 29 and a normalizing index depicting the ANG measure as a greater or lesser fraction of the active measure (as described on pp. 60-61) is shown. As before, this normalization ignores any weighting of areas that may be more important than other areas; its purpose is

*Other scales could be devised. The purpose is only to put the measures into a numerical form for an overall comparison.

Table 28

MANAGEMENT EFFECTIVENESS INSPECTION RESULTS

(March 1975 and May 1975, respectively)

Function	23d TFW (USAF)						140th TFW (ANG)				
	No. of Criteria	Laudat. Comment	Minor Defic.	Major Defic.	N/A[a]	Mean[b]	Laudat. Comment	Minor Defic.	Major Defic.	N/A[a]	Mean[b]
Command	9		8	1		1.9		4	2	3	1.7
Operations	1		1			2.0		1			2.0
DC/operations	9	1	8			2.1	1	5		2	2.2
Tactical squadrons	12		11		1	2.0	2	5	2	3	2.0
Combat support group staff	5		4	1		1.8	1		3	1	1.5
Combat support group support	21		17	4		1.8		12	1	8	1.9
Support services	1		1			2.0		1			2.0
Personnel	14		14			2.0		10		4	2.0
Special services	7		6	1		1.9				7	
Administration	3		3			2.0		3			2.0
Security police	8		2	6		1.3		7		2	2.0
Comptroller	7	1	6			2.1		7			2.0
Civil engineering	9	2	5	2		2.0		4		5	2.0
Mobility	13		10	2	1	1.8		4	6	3	1.4
Safety	6		6			2.0		6			2.0
Base communications electronics	5	4	1			2.8				5	
Weather	5			5		1.0				5	
DC/logistics	3		3			2.0		3			2.0
Organizational maintenance	26	1	23	2		2.0		21	1	4	2.0
Intermediate maintenance	29	1	23	1	4	2.0	1	22		6	2.0
Supply	34		15	18	1	1.5		33		1	2.0
Logistics	1		1			2.0		1			2.0
Total	228	10	168	43	7	1.8	5	149	15	59	1.9

[a]Not applicable.

[b]Sum of column entries were weighted by their evaluation category values (i.e., laudatory comment = 3, minor deficiency = 2, and major deficiency = 1) and divided by the number of criteria that were measured.

Table 29

A-7 COMPARISON SUMMARY

Measure	23d TFW	140th TFW	Assessment	
			23d TFW	140th TWF
WRSK (%)	83	85	1.0	1.0
UCMS overall rating (%)	80	77	1.0	1.0
Total pilot flying hours	1508	2547	1.0	1.7
Total pilot combat flying hours	288	256	1.0	0.9
Total pilot A-7 flying hours	341	92	1.0	0.3
Mission-ready crews (% of formed)	76	83	1.0	1.1
Abort rate (%)	3.8	2.6	1.0	1.5
OR rate (%)	35.5	44.0	1.0	1.2
Maintenance experience (years)	6.1	10.7	1.0	1.8
DMMH/FH	19.8	29.2	1.0	0.7
Base self-sufficiency (%)	97.0	99.5	1.0	1.0
Accident rate (per 100,000 hours)[a]	8.7	7.4	1.0	1.2
ORI	Sat.	Sat.	1.0	1.0
Successful refueling (%)			1.0	1.0
Low-angle bomb (CEP, ft)			1.0	0.6
Low-angle drag (CEP, ft)			1.0	0.8
Dive bomb (CEP, ft)			1.0	1.1
Strafe effectiveness (%)			1.0	0.9
Weapons firing effectiveness (%)			1.0	1.0
Munitions crew effectiveness (%)			1.0	1.3
MEI mean	1.8 (Sat.)	1.9 (Sat.)	1.0	1.1

[a]Air-Force-wide A-7 accident rates.

simply to put all of the comparisons on a common basis to allow further comparison across weapon systems.

COMPARISON OF C-130 UNITS

For purposes of comparison we selected the USAF's 314th Tactical Airlift Wing (TAW), Little Rock AFB, Arkansas, and the USAFR's 433d TAW, Kelly AFB, Texas. The 314th TAW consisted of five operational squadrons (two of which were training squadrons) and a total of 87 UE aircraft. The 433d TAW has a single collocated squadron, the 68th TAS, with 16 UE aircraft.* It also commands the 924th TAG, which moved

*This USAFR 16 UE squadron resulted from the recent consolidation of two collocated 8 UE squadrons.

recently from Ellington AFB to Bergstrom. Note that figures for the 433d TAW used in these comparisons are limited to the units located at Kelly AFB.

USAF C-130 squadrons have 16 UE aircraft; ANG and USAFR squadrons have 8 or 16 aircraft. The present force of 30 squadrons within the ARF comprises 3 squadrons of 16 UE and 27 squadrons of 8 UE. While the 8 UE unit is most common, our comparison employs a 16 UE unit to avoid as much as possible the problems of scaling and other artificialities.

The authorized manning for the two wings revealed close comparability in the distribution of manning as well as in the ratios of personnel per UE, as shown in Table 30. The only notable difference between the units was in maintenance, where the active unit with C-130Es was less heavily manned as a proportion of wing strength and per UE than the USAFR unit with its older C-130Bs. The comparison also reveals the lower crew ratio in the USAFR airlift squadron. The somewhat lower support ratios for the active unit suggest that there may have been some scale economies in supporting the large active wing.

Table 30

MILITARY MANPOWER AUTHORIZATIONS FOR THE 314th TAW (USAF) AND THE 433d TAW (USAFR)

(As of the end of FY 1975)

Element	314th TAW Manpower			433d TAW Manpower		
	No. Auth.	% of Total	No. per UE	No. Auth.	% of Total	No. per UE
Wing	517	10.8	5.9	55[a]	6.1	3.4
Airlift squadron(s)	913	19.1	10.5	139[b]	15.4	8.7
Maintenance	1693	35.5	19.5	376	41.6	23.5
Support[c]	1653	34.6	19.0	333	36.9	20.8
Total	4776	100.0	54.9	903	100.0	56.4

SOURCES: Refs. 6 and 19.

[a]Pro rata share.

[b]68th TAS only.

[c]Excludes aerial port and aeromedical evacuations.

Mobility Readiness

Plans. As resources planned for use in support of tactical operations, the C-130 fleet can mobilize, deploy, and operate at bases outside the CONUS. At the time of our study, all tactical airlift units were complying with the requirements of TACM 400-1.(21) Each unit had an approved mobility plan and had been inspected on most features of such plans. There was a difference in the intensity and the duration of the inspection, with a two day limitation on ARF inspections and an eight day no-notice inspection of the regular units.

The mobility requirements for airlift units are somewhat different from those of tactical fighter units. Airlift units are trained to deploy and operate at various overseas bases and have both organizational and intermediate-level maintenance capability and the troop support resources necessary to sustain such operations. ANG and USAFR units have such designated support resources organized into special "mobility support" and "weapon system security" flights that, together with the consolidated aircraft maintenance squadron, airlift squadron, and wing/group headquarters, constitute their mobility package. In the case of the 433d TAW (USAFR), these units consisted of 661 personnel, about 70 percent of the total unit manpower.

The mobility plans for the USAFR unit include the usual recall, assembly, and time scheduling of each of the designated packages that are to be deployed. The plans of the 314th TAW specified that only three of the wing's five squadrons be available for immediate deployment; a fourth was to be available after twenty days. The training squadron was not deployable.

During the last MEIs conducted just prior to this study, both wings were judged to be satisfactory overall; however, both units had some deficient aspects. In both instances the deficiencies were minor and correctable and the exercises demonstrated that the units could be assembled, and could marshal and load mobility equipment for deployment within the planned time schedule.

Unit Capability Measurement System. Three squadrons of the USAF's

314th TAW* as well as the single collocated airlift squadron of the USAFR's 433d TAW had identical assigned primary and secondary designed operational capabilities (DOCs): support airlift combat (tactical mobility) and support airlift logistic mobility, respectively.

We have computed mean UCMS scores for both the primary and secondary DOCs for the three active squadrons to compare them with the scores of the primary and secondary DOCs of the USAFR unit. These UCMS scores shown in Table 31 represent seven-month averages for the USAF wing and four-month averages for the USAFR wing, through July 30, 1975, which were the complete reported results to that date since the inception of UCMS.

Table 31

UCMS MEAN SCORES[a] FOR THE 314th TAW (USAF)
AND THE 433d TAW (USAFR)
(Through July 30, 1975)

	Primary DOC		Secondary DOC	
Measure	314th TAW	433d TAW[b]	314th TAW	433d TAW[b]
Equipment	77	59	73	77
Crews	59	82	55	82
Personnel	86	98	84	98
Overall	58	59	59	75

SOURCE: Ref. 23.

[a]UCMS ratings are based on a scale presented in Ref. 24. The numbers are not direct percentages of authorized or available personnel or equipment.

[b]Kelly AFB units only.

There was close comparability overall between the USAF and USAFR units in the primary DOC, but the USAFR scored significantly higher in all areas of the secondary DOC.

*With the exception of the transition training squadron, which had no mobility mission, and the 61st Squadron, which was a combat crew training squadron and had a D+20 deployment assignment.

Employment Capability

The units differed in their capability to accomplish the tactical airlift mission, which was inherent in the aircraft model and mission of each unit. The 314th TAW (USAF) was equipped with C-130E aircraft, all of which had station-keeping equipment and some of which had incorporated all-weather aerial delivery systems. The 433d TAW (USAFR), with C-130Bs, did not have this additional equipment.

Proficiency Requirements. Both units were trained under the same general set of requirements: AFM 51-130[32] and the applicable MAC supplement (MAC SUP2)[33]. These requirements currently are event-oriented rather than sortie-oriented and for mission-ready status consist of a combination of the Phase III basic proficiency flying requirements and 83 specified events. Mission-capable status includes the same basic proficiency requirements but only one-half of the mission-ready requirements per six months. Special training is also required for qualification with all-weather aerial delivery systems and station-keeping equipment. The USAFR unit was not qualified in these two areas, or in low-altitude parachute extraction system, high altitude low opening, night attack, and special operations low level (SAW) operations. However, only three crews in each active squadron had to be qualified in the latter four operations. MAC staff officers advised us that given the appropriate equipment, USAFR crews could be upgraded in these special training events with the following additional training shown in Table 32.

Table 32

ADDITIONAL TRAINING NEEDED TO UPGRADE USAFR CREWS

Training Category	Events	Hours
Low-altitude parachute extraction system[a]	12	6
All-weather aerial delivery system	10	40
Station-keeping equipment	14	10

[a]Three flights. (Only three crews per squadron need this training.) High altitude low opening and special operations low level were not mentioned, but they total only three additional events.

Pilot Experience Levels. The experience levels of the pilots of both units, as of April 1975, are shown in Table 33. Pilot totals include all pilots--line, staff, and upgrade students.

Table 33

C-130 PILOTS AVERAGE FLYING EXPERIENCE (HOURS)
(As of April 1975)

Type of Flying Hour	Hours of Experience	
	314th TAW (USAF)	433d TAW (USAFR)
Total	1812	3149
Combat	254	217
C-130	1302	990

SOURCE: Air Force Inspection and Safety Center.

These were fairly typical of the fleetwide averages in this aircraft, reflecting the greater overall flying experience of the ARF pilot and his somewhat lower UE experience. One significant difference in the composition of each unit's pilot force can be seen in the C-130 time distributions, as shown in Table 34.

Table 34

DISTRIBUTION OF PILOT C-130 EXPERIENCE IN THE 314th TAW (USAF) AND THE 433d TAW (USAFR)
(As of April 1975)

Total Flying Hours	314th TAW		433d TAW	
	No. of Pilots	% of Total	No. of Pilots	% of Total
< 250	46	11.4	2	2.9
250-499	39	9.6	15	21.4
500-749	46	11.4		
750-999	61	15.1	17	24.3
1000-1999	132	32.7	11	15.7
2000-2999	54	13.4	5	7.1
≥ 3000	26	6.4		
Total	404	100.0	70	100.0

SOURCE: Air Force Inspection and Safety Center.

From this distribution we can see that the average C-130 time of the active unit is affected by the proportionately large number of inexperienced pilots in the training squadrons (46). If the first category were excluded from the comparison there would be little difference between the units.

The descriptive profiles of the crews in the entire active MAC C-130 force are shown along with the 433d TAW (USAFR) profile in Table 35. In general, the USAFR crew members averaged one higher grade, were somewhat older, had more years of service and rated experience, were about equal in UE flying time, but had more total flying time.

Table 35

MAC CREW DESCRIPTIVE PROFILES COMPARED WITH USAFR's 433d TAW[a]

(As of April 1975)

Position	Grade		Age		Years Service		Years Rated		UE Flying Hours		Total Flying Hours	
	MAC	433d	MAC	433d	MAC	433d	MAC	433d	MAC	433d	MAC	433d
Instructor	0-3	0-4	31	47	8	15	6	14	1958	1918	2557	4344
Aircraft commander[b]	0-3	0-3	31	36	8	13	6	12	1319	885	2298	3301
Copilot[b]	0-2		27		4		3		609		896	
Navigator	0-2	0-4	30	36	6	14	5	13	1059	1268	1964	4122
Flight engineer	E-5	E-6	34	36	13	15	N/A[c]	6	N/A	1431	N/A	2326
Loadmaster	E-5	E-6	31	34	11	13	N/A	6	N/A	777	N/A	1836

SOURCES: Ref. 34 and personal communication from the 433d TAW.

[a]Kelly AFB units only.

[b]Separate aircraft commander and copilot statistics were not available for reserve crews.

[c]Not available.

Mission-Ready Crews. The bulk of the crews in both units were considered to be mission-ready, as shown in Table 36.

The 314th TAW (USAF) had a surplus of pilots for their line pilot assignments, averaging about 108 percent of authorized levels; the limiting resource on crew formation was the flight engineer, and the average number of crews formed and mission-ready during this period

Table 36

AVERAGE MISSION-READY STATUS OF C-130 LINE CREWS IN THE 314th TAW (USAF) AND THE 433d TAW (USAFR)

(January through April 1975)

Status	314th TAW	433d TAW[a]
Authorized	96	24
Assigned	96	23
Mission-ready	87	20
Mission-ready ÷ assigned	91%	87%

SOURCES: Ref. 35 and data furnished by the 433d TAW.

[a]68th TAS only.

reflected this limitation. It should be noted that the reserve unit was authorized a 1.5 crew ratio on their C-130 aircraft, whereas the 314th had a 2.0 crew ratio. Thus, while the USAFR unit was able to man all operationally ready aircraft within the specified requirements, the USAF unit had a larger apparent cushion in ability to immediately man and sustain prolonged air operations.*

Elements of both wings regularly participated in lift operations outside the CONUS. Both units regularly supported Army tactical lift mission operations and joint scheduled unit exercises. For most routine (DOC) lift missions both units were fully qualified within the inherent capabilities of their unit equipment.

Flying Activity/Performance. There was a significant difference between the units in the intensity of flying activity per aircraft as shown in Table 37. The higher utilization rates of the 314th TAW (USAF) were typical of flying-hour differences between active and reserve units. The active units, therefore, required more intensive utilization of their maintenance resources and closer scheduling. Although the bulk of the maintenance on the 433d TAW's aircraft was performed by fewer than 150 full-time air reserve Technicians, the less

*ARF C-130 units that are equipped with the E model are authorized a crew ratio of 2.0. Therefore, transfers of C-130Es to the ARF would not result in reduced crew strength for those aircraft.

Table 37

FLYING ACTIVITY IN THE 314th TAW (USAF)
AND THE 433d TAW (USAFR)

(January through April 1975)

Item	314th TAW	433d TAW[a]
Authorized UE	87	16
Average possessed UE	66.4	12.3
Sorties per month	1066	122
Sorties per UE per day[b]	0.73	0.45
Hours per month	4020	433
Hours per possessed UE per month	60.5	35.2

SOURCES: Refs. 36 and 37.

[a]68th TAS only.

[b]Based on 22 flying days per month.

demanding reserve flying schedule permitted a more orderly maintenance activity.

Quality of the work accomplished was measurable to some extent by examination of ground and air aborts over identical flying periods, shown in Table 38. Both units had abort rates well within the MAC acceptable standard of 3 percent, and the rates showed no difference between the units.

Table 38

GROUND AND AIR ABORTS

(January through April 1975)

Unit	Sorties[a]	Air Aborts	Ground Aborts	Abort Rate (%)
314th TAW (USAF)	4290	26	25	1.2
433d TAW (USAFR)[b]	495	2	6	1.6

SOURCES: Refs. 36 and 37.

[a]Including ground aborts.

[b]68th TAS only.

While there were differences in the models and ages of the UE aircraft in the two units, all could perform the tactical airlift missions effectively, depending on the OR status of the fleets. Although OR rates reflect only the transient condition of the fleets, they can provide readiness trends. Rates for the four months from January to April 1975, were quite comparable, as is shown in Table 39.

Table 39

OPERATIONAL READINESS RATES
(January through April 1975)

Unit	OR (%)	Flyable[a] (%)
314th TAW (USAF)	55.9	72.5
433d TAW (USAFR)[b]	53.4	77.6

SOURCES: Refs. 36 and 37.

[a]Includes OR plus flyable not operationally ready aircraft, which may have inoperative equipment aboard but are flyable for training purposes. Such deficiencies do not ground the aircraft.

[b]68th TAS only.

As was also noted in the A-7 comparison, the NORS rates were comparable throughout the period despite the lower official supply priority of the USAFR's 433d TAW. The lesser flying activity that is characteristic of ARF units may have compensated for the lower supply priority (see Table 40).

Maintenance. The operational program flown and the quality of operational activity are largely products of the maintenance resources applied. Table 41 shows comparative manning levels in the units and the experience levels of the work force. The active unit had a slightly higher manning level. However, as the relative experience of the two maintenance organizations may suggest, the USAFR had the edge in relative capability. On the basis of the required skills that were called

Table 40

COMPARISON OF NORS RATES

(January through April 1975)

Unit	NORS-G (%)	NORS-F (%)	Total NORS (%)
314th TAW (USAF)	2.8	8.7	11.5
433d TAW (USAFR)[a]	6.7	2.3	9.0

SOURCES: Refs. 36 and 37.

[a]68th TAS only.

for in the manning standards for the maintenance organizations, the USAF's 314th TAW had an 84 percent skill level manning;* in the USAFR's 433d TAW, the skill manning was greater than 95 percent in terms of

Table 41

MAINTENANCE MANNING AND EXPERIENCE LEVELS FOR THE 314th TAW (USAF) AND THE 433d TAW (USAFR)

(As of May 1975)

Manpower Category	314th TAW	433d TAW
Authorized strength	1679	376
Assigned strength	1643	358
Assigned ÷ authorized	98%	95%
Average experience (years)	6	11

SOURCES: Refs. 36 and 37 and data from the 433d TAW.

personnel being qualified to skill objectives. (In the 9, 7, and 5 skill levels, the USAFR unit was "overqualified.")

*Enlisted skill manning in the three maintenance squadrons of the 314th TAW as of May 1975 was as follows:

Skill Level	Authorized	Assigned	Percent
9	37	26	70
7	277	198	71
5	938	871	93
3	401	287	72
1	0	261	--

The relative maintenance capability of the two wings also can be compared by means of their base self-sufficiency--the proportion of total unserviceable parts generated during a given period that could be repaired at the base. During January through April 1975 the active unit had a self-sufficiency score of 98.5 compared with 92.5 for the USAFR unit. The numbers of items generated to repair were much smaller in the reserve unit. Therefore the month-to-month *mix* of NRTS* items had a higher impact on the self-sufficiency index in this unit than on the USAF's 314th.† Even with this high variability and lower priority-precedence designator, the reserve unit had an acceptable index.

Another index of the relative capability of the maintenance staff was implicit in the experience level of personnel. The USAF's 314th TAW maintenance work force appeared to be representative of MAC as a whole: approximately six years' experience with about 50 percent of the force in the four-years-and-under category. In contrast, the maintenance experience level in the USAFR's 433d TAW was 11 years, including both part-time reservists and Technicians.‡ The DMMH/FH ratios were not used in this comparison because of significant differences in the maintenance requirements of the C-130E aircraft that is assigned to the active wing and the older C-130B aircraft of the USAFR wing.

Accident Rates. Fleetwide major and minor accidents for the past five years indicate that the record of the C-130 ARF units approximates that of the USAF. This safety record, expressed as the number of major and minor accidents per 100,000 flying hours, is shown in Table 42.

The USAF rate for the five-year period was 2.9 compared with the USAFR's 1.5, and ANG's 2.3, and the overall ARF of 1.8.

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*Not reparable this station.

†The index for April 1975 showed the following for the two units:

Unit	Total Generation	No. Repaired	No. NRTS	Self-Sufficiency (%)
314th TAW	2587	2549	38	98.5
433d TAW	119	113	6	95.0

‡Such longevity in ARF maintenance squadrons is the norm.

Table 42

C-130 ACCIDENT RECORDS: MAJOR AND MINOR

(Through May 1975)

Year	USAF			USAFR			ANG		
	Hours Flown	No. of Accidents	Rate[a]	Hours Flown	No. of Accidents	Rate[a]	Hours Flown	No. of Accidents	Rate[a]
1971	349,005	7	2.0	25,285	0	0	13,211	0	0
1972	303,370	13	4.3	44,845	1	2.2	27,774	2	7.2
1973	239,759	5	2.1	52,172	0	0	34,701	0	0
1974	203,720	8	3.9	57,669	1	1.7	39,702	1	2.5
1975	74,759	1	1.3	18,714	1	5.3	14,862	0	0
Total	1,170,613	34	2.9	198,685	3	1.5	130,250	3	2.3

SOURCE: Air Force Inspection and Safety Center.

[a]Rate is accidents per 100,000 flying hours.

Operational Readiness Inspections. The results of the most recent ORIs at the time of our study, conducted by TAC at the 314th TAW (USAF) and by Twelfth Air Force at the 433d TAW (USAFR), are shown in Table 43. We combined the individual ORI scores for the 32d, 50th, and 61st TAS into a total (or mean in the case of CEA*) score to represent the 314th TAW, for ease of comparison with the single scores of the 433d TAW (USAFR).

Although the actual scores had to be normalized to conceal the actual figures, the results show that the 433d TAW (USAFR) performed those events for which it had a mission/training requirement in a manner that would reflect equal proficiency with the USAF unit.

Management Effectiveness Inspection. MEIs were accomplished concurrently with the ORIs. In the 314th TAW (USAF) specific areas in supply management and mobility exercises were rated unsatisfactory, whereas in the 433d TAW (USAFR) there were major deficiencies in comptroller operations and mobility plans, but those deficiencies were judged as not affecting the readiness ratings significantly. Both units were given an overall satisfactory rating. As in the A-7 case, the active

*Circular error average.

Table 43

OPERATIONAL READINESS INSPECTIONS OF THE 314th TAW (USAF) AND THE 433d TAW (USAFR)[a]

(May 1974 and March 1975, respectively)

Status/Events	Measure	314th TAW[b]	433d TAW
Aircrews			
Formed	Percent of authorized	1.0	1.1
Mission-ready	Percent of formed	1.0	1.1
Sorties flown	Percent of scheduled	1.0	1.0
Airlift events			
Aeromedical evacuation			
Events effective	Percent of those evaluated	1.0	0.0[c]
Shortfield landing			
Sorties flown	Percent of scheduled	1.0	1.3
Sorties effective	Percent of flown	1.0	1.5
Personnel drop			
Sorties flown	Percent of scheduled	1.0	1.2
Sorties effective	Percent of flown	1.0	1.3
Circular error average	--	1.0	2.5
Heavy equipment drop			
Sorties flown	Percent of scheduled	1.0	1.2
Sorties effective	Percent of flown	1.0	1.3
Circular error average	--	1.0	1.2
Container delivery system drop			
Sorties flown	Percent of scheduled	1.0	1.2
Sorties effective	Percent of flown	1.0	1.4
Circular error average	--	1.0	0.6

[a]Scores are normalized. For this comparison the USAF scores are shown as 1.0 regardless of the actual value. The USAFR scores are shown as a greater or lesser fraction of the USAF score.

[b]Low-altitude parachute extraction system and nuclear loading events are not shown.

[c]Only one aircraft configured for this category.

unit was inspected over eight days with no prior notice, and the ARF unit was inspected over two days with 30 days prior notice.

Summary

The foregoing discussion has included a wide and diverse range of measures compiled to compare two similarly equipped active and ARF C-130 units. All measures discussed in this section are summarized in Table 44.

Table 44

C-130 COMPARISON SUMMARY

Measures	314th TAW	433 TAW	Assessment	
			314th TAW	433 TAW
UCMS overall (primary DOC)	58	59	1.0	1.0
UCMS overall (secondary DOC)	59	75	1.0	1.3
Total pilot flying hours	1812	3149	1.0	1.7
Total pilot combat flying hours	254	217	1.0	0.9
Total pilot C-130 flying hours	1302	990	1.0	0.8
Mission-ready crews (% of assigned)	91	87	1.0	1.0
Abort rate (%)	1.2	1.6	1.0	0.8
OR rate (%)	55.9	53.4	1.0	1.0
NORS-G/F (%)	11.5	9.0	1.0	1.3
Maintenance experience (years)	6	11	1.0	1.8
Base self-sufficiency (%)	98.5	92.5	1.0	0.9
Accident rate (per 100,000 hours)[a]	2.9	1.5	1.0	1.9
ORI	Sat.	Sat.	1.0	1.0
Aeromedical evacuations (% effective)			1.0	0
Shortfield landing (% effective)			1.0	1.5
Personnel drop (% effective)			1.0	1.3
Circular error average			1.0	2.5
Heavy equipment drop (% effective)			1.0	1.3
Circular error average			1.0	1.2
Container delivery system drop (% effective)			1.0	1.4
Circular error average			1.0	0.6
Scheduling (% effective)			1.0	1.0
MEI	Sat.	Sat.	1.0	1.0

[a]Air-Force-wide C-130 accident rates.

COMPARISON OF RF-4C UNITS

For purposes of comparison we selected the USAF's 67th TRW, Bergstrom AFB, Texas, and the ANG's 117th TRW, Birmingham Municipal Airport, Alabama. The 67th TRW had three reconnaissance squadrons, two of which had wartime commitments as "dual-based" units to USAFE. The two dual-based squadrons were maintained in a high state of readiness to meet their rapid deployment criteria. In contrast to other (non-dual-based) wings, the 67th was responsible for the continuation training only of assigned aircrews and did not conduct formal transition or readiness training.

The ANG's 117th TRW also had command jurisdiction over three RF-4C reconnaissance squadrons but only one was collocated with the

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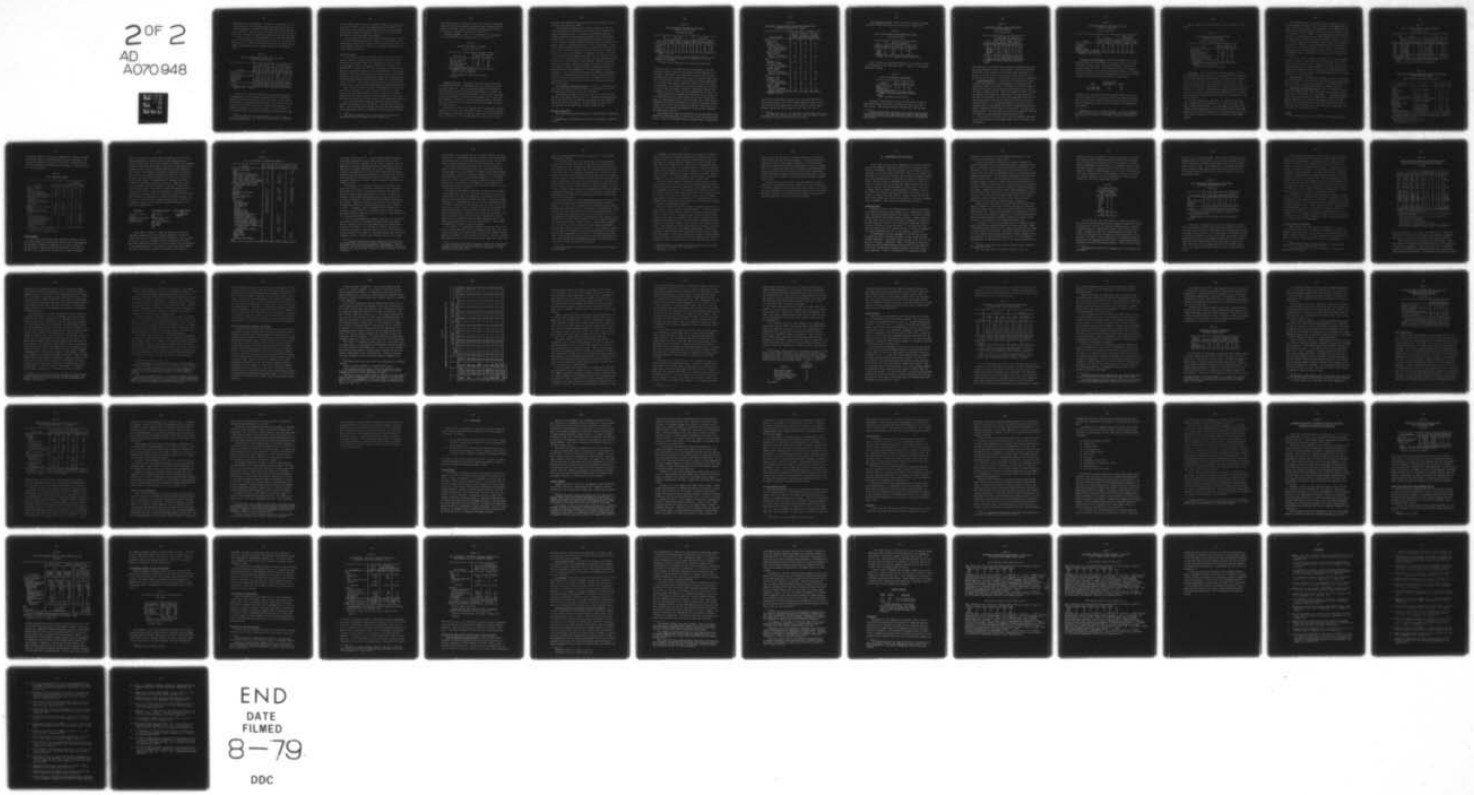

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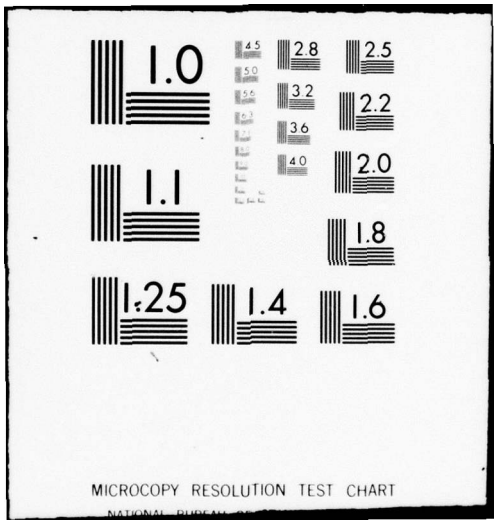
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wing headquarters at Birmingham. The other two, organized into separate groups with their own maintenance and support units, were located at Montgomery, Alabama (the 187th TRG), and Lincoln, Nebraska (the 155th TRG). Unlike the previous comparisons, the detached RF-4C groups are included in the statistics shown below for the 177th TRW.*

Each of the tactical RF-4C squadrons of the 67th TRW (USAF) and the 117th TRW (ANG) was authorized 18 UE aircraft, for a total of 54 RF-4Cs per wing. However, there was some variance in operational and support manning authorizations between the wings, as indicated in Table 45.

Table 45

MANPOWER AUTHORIZATIONS FOR THE 67th TRW (USAF) AND THE 117TH TRW (ANG)

Element	67th TRW Manpower			117th TRW Manpower		
	No. Auth.	% of Total	No. per UE	No. Auth.	% of Total	No. per UE
TR wing group	352	10.7	6.5	158	5.2	2.9
Recce technical squadron	77	2.3	1.4	80	2.6	1.5
TR squadron	432	13.2	8.0	471	15.5	8.7
Maintenance	1042	31.8	19.3	924	30.3	17.1
Support	1378	42.0	25.5	1415	46.4	26.2
Total	3281	100.0	60.7	3048	100.0	56.4

SOURCES: Refs. 5 and 19.

The USAF's 67th TRW was proportionately more heavily manned in wing headquarters and maintenance, whereas the ANG's 117th TRW was somewhat more heavily manned in aircrews and support unit personnel. The difference in support personnel per UE was considerably less pronounced than was noted above in the A-7 and C-130 comparisons. Although the support ratio of the 117th TRW is in line with those of the other ARF wings, reflecting their dispersed squadron-basing mode,

*The 117th TRW also had responsibility for the RF-101 group at Key Field, Mississippi. This unit was excluded from the comparisons made in this section.

the 67th TRW's support ratio was considerably higher than those of the other active wings.* Much of the additional support manning of the 67th TRW can be attributed to the housekeeping activities provided for non-wing base tenants at Bergstrom. The A-7 and C-130 active wings had only minor non-wing support requirements.

The Air Technician staff, which comprised approximately 25 percent of the total military personnel authorizations of the ANG unit, provided support for most unit activities other than during the UTA. Most of the flight training and a portion of the ground training were conducted during non-UTA time.

Mobility Readiness

Active units assigned to TAC and ARF units for which TAC is the gaining command are required to maintain mobility plans that cover preparation and movement under all contingencies for which a particular unit may be tasked. These plans, developed in compliance with AFM 28-40[20] and TACM 400-1,[21] cover the assembly, marshaling, processing, loading, and dispatching to an employment base. The primary objective of the unit mobility plan is to insure that the unit follows a methodical procedure in generating and dispatching a required force within the time allowances established in COMTAC Force Generation Publication 200.[22] Under current contingency plans for tactical reconnaissance units, the largest deployment package contains 18 UE aircraft.

Both the USAF's 67th and the ANG's 117th TRWs had mobility plans that had been approved by TAC and exercised on numerous occasions. Mobility and operations personnel of both the 67th and the 117th emphasized that the mobility plan only provided guidance for home base mobility actions and did not cover enroute or employment base activities.

The 117th TRW's advisor wing, the 363d TRW, provided detailed guidance and assistance in the development of the ANG unit's mobility plans. Once these plans were approved both USAF and ANG wings/groups were tested against them at each ORI/MEI. Mobility plans of the 67th

*The support manning per UE for the active A-7 wing was 16.2 (Table 18); for the C-130 wing it was 19.0 (Table 30).

and 117th wings were identical in areas such as alerting, recalling, marshaling, loading, processing, and dispatching the required force. Inspection (ORI/MEI) reports indicated that both wings were rated satisfactory in mobility with no major deficiencies.

Mobility Equipment. Table 46 is a compilation of assessments of both wings' mobility equipment status as of June 1975.

Table 46

EQUIPMENT READINESS, IN PERCENT

(As of June 1975)

Equipment Type	67th TRW[a] (USAF)	117th TRW[a] (ANG)
Mobility equipment	97	98
780 equipment	N/R	98
Personnel equipment	N/R	99
Field equipment	N/R	99
War readiness spares kit	95	95

SOURCES: Refs. 38 and 39.
NOTE: N/R = not reported.

[a]Percentages are mean scores for three squadrons.

Mobility Exercises. Considerable experience is gained through the deployment of units or detachments away from home base for field or mobility exercises. The two dual-based squadrons of the USAF's 67th TRW regularly deploy to their European bases for training. Besides this over-water deployment experience, one or more of the squadrons may participate in a tactical field exercise for 30 or more days while deployed. During 1975, the 67th TRW participated in five exercises and operations requiring deployment within the CONUS, and three exercises overseas.

Squadrons of the ANG's 117th TRW had limited deployment experience compared to the units of the 67th TRW; however, one of the 117th squadrons deployed a detachment to Alaska in January 1975 and another RF-4C unit participated in a full unit deployment to Europe in early 1976.

All three 117th TRW units had regularly deployed and operated on tactical exercises within the CONUS.

From available information there did not appear to be any outstanding difference in the ability of the units of the 67th and 117th wings to marshal and deploy. The greater consolidation and more frequent exercising of the deployment packages of the 67th TRW would likely allow it to conduct somewhat smoother deployments, but units of the 117th had consistently demonstrated the ability to organize and deploy within an established time period. For the deployment of individual squadron packages* short of the entire wing, the 67th wing will be in a more desirable position, as the full assets of the wing may be drawn on to fill out any personnel or equipment shortages. The units of the 117th may use the same procedure but the time required to transfer assets to the deploying unit from either of the outlying groups may cause a delay in the movement of some elements. Because of aircraft and support equipment inspection schedules, neither the 67th nor the 117th would be capable of deploying three full squadron packages immediately without some augmentation. The ANG wing would be at an advantage, as all three units were manned and equipped for independent operations. Although ARF units are usually given a training and consolidation period following mobilization, the commander of the 117th TRW affirmed that he could deploy at least one full squadron package within three days.

Unit Capability Measurement System. Table 47 is a compilation of UCMS scores through July 1975, averaged over seven moths for the 67th TRW (USAF) and four months for the 117th TRW (ANG).

The individual squadron scores are, in the case of the 67th TRW, averages of the daily scores for the full seven-month reporting period, and in the case of the 117th TRW they are averages of the bi-monthly scores for the full four months. The mean scores for each wing are our summaries of the wing's scores in each evaluation area.

Employment Capability

The essential measurable differences in the operational capabilities

*A personnel and equipment force sized for the support of 18 RF-4C aircraft.

Table 47

UCMS MEAN SCORES[a] FOR THE 67th TRW (USAF)
AND THE 117th TRW (ANG)

(Through July 1975)

	67th TRW				117th TRW[b]		
Measure	12 TRS	91 TRS	45 TRS	Mean	106 TRS	160 TRS	Mean
Equipment	100	100	100	100	96	99	98
Crews	74	75	72	74	92	100	96
Personnel	97	97	97	97	95	95	95
Overall	74	75	72	74	90	95	93

SOURCE: Ref. 23.

[a]UCMS ratings are based on a scale presented in Ref. 24. The numbers are not direct percentages of authorized or available personnel or equipment.

[b]155 TRG, Lincoln, Nebraska, not reported for this period.

of tactical units of the USAF's 67th TRW and the ANG's 117th TRW existed as a direct result of the respective DOC assignments of the two wings. RF-4C units are equipped and trained for day and night reconnaissance tasks; however, the inventory of required sensor equipment for both tasks is limited and the aircrew training requirements is so extensive that reserve crews do not receive full qualification in both phases. Only active RF-4C crews have enough time to perform the sorties that are needed to support a complete day and night DOC assignment, given the sorties-per-event standards that TAC specifies.

ANG RF-4C units were assigned one primary DOC (day or night) and one secondary DOC (day or night) because of the fewer sorties available in an ANG squadron within a given training cycle--an ANG aircraft commander received only 66 percent of the sorties to maintain qualification that his active duty counterpart received. Table 48 is a compilation of crew training requirements for RF-4C aircraft commanders and weapon system officers.

Upon mobilization, ANG units would have the crew availability and maintenance manning necessary to achieve full "dual" DOC mission-ready status. Since, in the normal course of training events, the ANG pilot

Table 48

SEMIANNUAL TRAINING SORTIES REQUIRED FOR MISSION-READY AND MISSION-CAPABLE RF-4C AIRCREWS

DOC Assignment	Mission-Ready Standards	Mission-Capable Standards	Mission-Capable Minimums
Active unit			
Primary, day	30	21	17
Primary, night	26	18	14
Air combat training			
Basic flight manning	2	2	2
Air combat manning	2	2	2
Mission support	12	10	7
Total sorties			
Aircraft commanders	72	53	40
Weapon system officers	68	49	38
ANG			
Primary, day	30	21	17
Secondary, night	10	8	7
Air combat training			
Basic flight manning	2	2	2
Mission support	6	4	4
Total sorties			
Aircraft commanders	48	35	30
Weapon system officers	46	33	28
ANG			
Primary, night	26	18	14
Secondary, day	14	11	10
Air combat training			
Basic flight manning	2	2	2
Mission support	6	4	4
Total sorties			
Aircraft commanders	48	35	30
Weapon system officers	46	33	28

SOURCE: Ref. 40.

will have had considerable training in all the events required for active units except for the two air combat maneuver sorties, an activated ANG unit would require only a short period to complete those aircrew training sorties necessary to reach "dual" DOC status.*

*The high ORI scores of the 160th TRS for both primary and secondary DOCs (Table 55) indicate that these ANG crews were highly proficient even without further, post-mobilization, training.

Pilot Experience Levels. Table 49 shows the comparative flying experience levels of both units' pilot forces as of March 1975.

Table 49

RF-4C PILOTS AVERAGE FLYING EXPERIENCE (HOURS)
(As of March 1975)

Type of Flying Hour	Hours of Experience	
	67th TRW (USAF)	117th TRW (ANG)
Total	1962	2159
Combat	43	75
RF-4C	695	471

SOURCE: Air Force Inspection and Safety Center.

Table 50 shows the comparisons between the pilot forces in terms of experienced and less experienced pilots.* Overall, no outstanding differences existed.

Table 50

RF-4C PILOT EXPERIENCE COMPARISONS

Measure	67th TRW	117th TRW
Number of pilots	111	108
Experienced	71	69
Percent experienced	64	64

SOURCE: Air Force Inspection and Safety Center.
NOTE: Includes non-crew pilots.

In Table 51 the experience level of the 117th TRW, the only reserve RF-4C wing at that time, is compared with that of all USAF RF-4C pilots. Thirty-seven percent of the ANG pilots had less than

*Pilots "experienced" in tactical attack, fighter, and reconnaissance aircraft have at least 1000 total pilot hours in those aircraft and 500 hours as first pilot and/or instructor pilot in the specified type aircraft.

Table 51

DISTRIBUTION OF RF-4C PILOT FLYING HOURS,
TOTAL USAF AND ANG

(As of March 1975)

Total Flying Hours	Total USAF		Total ANG	
	No. of Pilots	% of Total	No. of Pilots	% of Total
< 100	187	27.7	33	24.4
100-299	116	17.1	17	12.6
300-499	83	12.3	58	43.0
500-999	150	22.2	22	16.3
≥ 1000	140	20.7	5	3.7
Total	676	100.0	135	100.0

SOURCE: Air Force Inspection and Safety Center.

300 flying hours in the RF-4C (the dividing line between experienced and less-experienced levels), whereas almost 45 percent of the USAF pilots were in that category. On the other hand, approximately 43 percent of the active force had in excess of 500 flying hours in the RF-4C, and only 20 percent of the reserve pilots were this experienced.

Mission-Ready Crews. A critical factor contributing to combat readiness and capability is the availability of trained aircrews. As indicated in Table 52, the ANG's 117th TRW had a sufficient number of mission-ready pilots (63) and weapon system officers (63) to man all the wing's assigned aircraft. On the other hand, the USAF's 67th TRW was limited by the number of trained pilots (53) and weapon system officers (41) available. Even if all the weapon system officers (53) were mission-ready, there was an insufficient number to man the 54 cockpit positions. As a possible explanation for the low overall readiness rate, it was observed that one of the squadrons of the 67th TRW was scheduled for deactivation in October 1975. To avoid a personnel surplus, it may have been in the process of gradually reducing the number of aircrews through administrative attrition.

In any event, at the time of our visit the statistics indicated that the 117th TRW was a more combat-capable force in terms of crew availability.

Table 52

LINE CREW READINESS IN THE 67th TRW (USAF)
AND THE 117th TRW (ANG)

(As of July 1975)

Status	Pilots		Weapon System Officers	
	67th TRW	117th TRW	67th TRW	117th TRW
Authorized	60	69	60	69
Assigned	68	69	53	67
Mission-ready	53	63	41	63
Mission-ready ÷ assigned	78%	91%	77%	94%

SOURCES: Refs. 28 and 41.

Flying Activity/Performance. The 67th TRW (USAF), with a dual (night and day) DOC, flew almost twice as many sorties as the 117th TRW (ANG), with one primary and one secondary DOC, for the period January through March 1975. Both wings appeared to have produced sufficient sorties to cover their training requirements. Air ground abort rates during this period were comparable, but OR rates (reported in Refs. 38 and 39) differed considerably, as shown below:

Unit	Ground and Air Abort Rate (%)	OR (%)
67th TRW (USAF)	2.8	76.5
117th TRW (ANG)	3.1	49.1

Inasmuch as the two units had fairly comparable NORS-G/F rates--4.9 in the 67th TRW and 6.8 in the 117th TRW--we were unable to identify the root cause of this large difference in OR rates; however, on the basis of this measure, the active unit appeared to be significantly more capable.*

*Apparently, it was a temporary problem. In the unit readiness statistics shown in Table 16, these ANG units had an average OR rate of 59 percent at the end of CY 1975 and 62 percent at the end of CY 1976.

Table 53 shows the flying activities of the two wings for this period.

Table 53

FLYING ACTIVITY OF THE 67th TRW (USAF)
AND THE 117th TRW (ANG)

(January through March 1975)

Item	67th TRW	117th TRW
Authorized UE	54	54
Average possessed UE	59.1	57.6
Sorties per month	817	414
Sorties per UE per day[a]	0.63	0.33
Flying hours per month	1507	939
Flying hours per possessed UE per month	25.5	16.3

SOURCES: Refs. 38 and 39.

[a]Based on 22 flying days per month.

Maintenance. The 67th TRW (USAF) was undermanned in levels 7 and 9 maintenance skills, within a total manning of about 102 percent. The 117th TRW (ANG) had about the same total manning, but, significantly, was fully manned in the supervisory 7 and 9 levels. This, of course, was largely due to the high skill levels of the full-time Technician force which constituted about 40 percent of the maintenance work force. Actually, the 117th TRW was somewhat undermanned in Technicians on the basis of assigned versus authorized slots, a situation which derived from budgetary limits rather than unavailability of manpower resources.

In terms of maintenance experience, the ANG's 117th TRW work force averaged 10.4 years compared to 6.6 years in the USAF's 67th TRW, a significant difference. The large number of relatively inexperienced airmen undergoing on-the-job training within the 67th TRW depressed their overall average, whereas the Technician force in the 117th, with an average of 13.6 years, contributed to their higher average.

Two additional metrics that provide some indication of the relative maintenance capability of the two wings are the DMMH/FH and the base self-sufficiency index. The limitations of the DMMH/FH for comparing active and ARF maintenance effectiveness were described in the A-7 comparison, above. Briefly, they include possible active and ARF differences in the factors that influence DMMH/FH ratios, such as level of flying activity, amount of deferred maintenance, amount of on-the-job training included in the man-hour totals, and age and condition of the aircraft. Moreover, the reserve DMMH/FH ratio may overstate the capability of the reserve maintenance force taken as a whole because most of the peacetime maintenance of reserve aircraft, the basis of the DMMH/FH ratio, is accomplished by the highly skilled cadre of Air Technicians.

Given these caveats it should be understood that the raw DMMH/FH ratios for January to April 1975--43.6 for the ANG unit and 37.0 for the active unit--are not strictly comparable and they should not be given much weight in the overall evaluation. The base self-sufficiency indexes which measure the units' in-house parts repair capabilities, were both 95.1 Again, the ANG percentage primarily measures the capability of its Air Technicians.

Accident Rates. Fleetwide major and minor accidents for the past five years indicate that the record of the ANG RF-4C units approximated that of the USAF. This record, expressed as the number of major and minor accidents per 100,000 flying hours, is shown in Table 54.

Operational Readiness Inspections. ORIs of the USAF's 67th and ANG's 117th TRWs revealed that for the items tested there was little difference in their levels of accomplishment. As discussed previously, active wings are inspected for a period of up to eight days, whereas ORIs for ANG units are conducted during weekend UTAs of two days. Results of the most recent ORI (at the time of the study), given to the three tactical squadrons of the 67th TRW and the 106th TRS of the 117th TRW, are compared in Table 55.

Summary

The foregoing discussion has included a wide and diverse range

Table 54

RF-4C ACCIDENT RECORDS: MAJOR AND MINOR

(Through May 1974)

Year	USAF			ANG		
	Hours Flown	No. of Accidents	Rate[a]	Hours Flown	No. of Accidents	Rate[a]
1971	56,653	4	7.1	1,949	0	0
1972	62,292	6	9.6	8,776	2	22.8
1973	63,928	5	7.8	11,027	0	0
1974	65,606	4	6.1	11,718	0	0
1975	21,806	7	32.1	3,803	1	26.3
Total	270,285	26	9.6	37,273	3	8.0

SOURCE: Air Force Inspection and Safety Center.

[a]Rate is accidents per 100,000 flying hours.

Table 55

OPERATIONAL READINESS INSPECTIONS OF THE 67th TRW (USAF) AND THE 117th TRW (ANG)[a]

(April 1975 and July 1974, respectively)

Status/Events	Measure	67th TRW	117th TRW[b]
Aircrews			
Formed	Percent of authorized	1.0	1.1
Mission-ready	Percent of formed	1.0	1.1
Munitions crews			
Formed	Percent of authorized	1.0	1.3
Certified	Percent of formed	1.0	1.1
Certified crews available	Percent of certified	1.0	1.1
Certified crews effective	Percent of those evaluated	1.0	1.1
Sorties flown	Percent of scheduled	1.0	0.9
Refuelings	Percent successful	1.0	1.0
Reconnaissance events			
Day target	Percent effective	1.0	1.0
Night target	Percent effective	1.0	1.1
SLAR[c]	Percent effective	1.0	0.7
Aircrew	Percent effective	1.0	1.0
Processing/reporting	Percent effective	1.0	1.0

[a]Scores are normalized. For this comparison the USAF scores are shown as 1.0 regardless of the actual value. The ANG scores are shown as a greater or lesser fraction of the USAF score.

[b]Birmingham units only (primary DOC = day).

[c]Side looking airborne radar.

of measures compiled for purposes of comparing two similarly equipped RF-4C units, namely the 67th TRW (USAF) and the 117 TRW (ANG). All measures are summarized in Table 56, along with a normalizing index (as before) depicting the ANG measure as a greater or lesser fraction of the active measure.

Table 56

RF-4C COMPARISON SUMMARY

Measure	67th TRW	117th TRW	Assignment	
			67th TRW	117th TRW
Mobility equipment (%)	97	98	1.0	1.0
WRSK (%)	95	95	1.0	1.0
UCMS overall rating (%)	74	93	1.0	1.3
Total pilot flying hours	1962	2159	1.0	1.1
Total pilot combat flying hours	43	75	1.0	1.7
Total pilot RF-4C flying hours	695	471	1.0	0.7
Mission-ready pilots (% of assigned)	78	91	1.0	1.2
Mission-ready weapon system officers (% of assigned)	77	94	1.0	1.2
Abort rate (%)	2.8	3.1	1.0	0.9
OR rate (%)	76.5	49.1	1.0	0.6
Maintenance experience (years)	6.6	10.4	1.0	1.6
DMMH/FH	37.0	43.6	1.0	0.8
Base self-sufficiency (%)	95.1	95.1	1.0	1.0
Accident rate (per 100,000 hours)[a]	9.6	8.0	1.0	1.2
ORI	Sat.	Sat.	1.0	1.0[b]
Successful refueling (%)			1.0	1.0[b]
Day target effectiveness (%)			1.0	1.0[b]
Night target effectiveness (%)			1.0	1.1[b]
SLAR effectiveness (%)			1.0	0.7[b]
Aircrew effectiveness (%)			1.0	1.0[b]
Munitions crew effectiveness (%)			1.0	1.1[b]

[a] Air-Force-wide RF-4C accident rates.

[b] 106th ARS only. (Primary DOC = day.)

OVERALL SUMMARY

Each of the three preceding case studies has exhibited a host of differences between active and reserve units in terms of quantitative and qualitative measures of capability; but in none of them did a pattern emerge to indicate the general superiority of one unit over the other *in the missions that the ARF unit is tasked to perform.*

While it is difficult to equate units or capability in such a broad, general assessment of disparate metrics, there appeared to be no significant difference in the units' capacity to perform their assigned missions. Other impressions gained by the authors from comparisons of command personnel, morale, equipment appearance, mission awareness, and a sense of job knowledge (although not quantifiable), indicated that all units were extremely professional, competent, and highly experienced, had participated extensively and effectively in exercises, and were fully capable of accomplishing all assigned requirements. In Table 57, ARF units' normalized scores (i.e., USAF unit's score = 1.0) are displayed together in search of a pattern of differences across aircraft types. But instead of identifying preferred ARF missions, the data showed a pattern of consistency. Recalling that a normalized score greater than 1.0 implies that the ARF unit was "better" than the USAF unit with regard to a particular measure and that, conversely, a score less than 1.0 implies the active unit is "better " it is possible to identify three groups of measures with which to categorize the compared units.

ARF Better	Approximately Equal	Active Units Better
Total pilot flying hours	UCMS overall	Pilot ~~per~~ FH (UE)
Maintenance experience	WRSK	DMMH/FH
Accident rate	Mission-ready crews (% of auth.)	
Munitions crews	Base self-sufficiency	
	ORI overall	
	Refueling	
	MEI	

We have made no attempt to weight the measures for an overall comparison, although some of the measures undoubtedly are more important than others in evaluating military capability. And, of course, we attach no value to the number of areas in which these particular ARF units surpassed the active units, or vice versa, or to the magnitude of the normalized scores. This, after all, was a very limited sample covering a brief period, and some of the units had only recently

Table 57

A-7, C-130, AND RF-4C COMPARISON SUMMARIES

Measure	A-7 (ANG)	C-130 (USAFR)	RF-4C (ANG)
Mobility equipment			1.0
WRSK	1.0		1.0
UCMS overall (primary DOC)	1.0	1.0	1.3
UCMS overall (secondary DOC)		1.3	
Total pilot flying hours	1.7	1.7	1.1
Total pilot combat flying hours	0.9	0.9	1.7
Total pilot flying hours ~~per~~ (UE)	0.3	0.8	0.7
Mission-ready pilots/crews	1.1	1.0	1.2
Mission-ready weapon system officers			1.2
Abort rate	1.5	0.8	0.9
OR rate	1.2	1.0	0.6
Maintenance experience	1.8	1.8	1.6
DMMH/FH	0.7		0.8
Base self-sufficiency	1.0	0.9	1.0
Accident rate	1.2	1.9	1.2
ORI	1.0	1.0	1.0
Refueling	1.0		1.0
Low-angle bomb	0.6		
Low-angle drag	0.8		
Dive bomb	1.1		
Strafe	0.9		
Weapons firing	1.0		
Munitions crews	1.3		1.1
Aeromedical evacuations		0	
Shortfield landing		1.5	
Personnel drop effective		1.3	
Circular error average		2.5	
Heavy equipment drop effective		1.3	
Circular error average		1.2	
Container delivery system drop effective		1.4	
Circular error average		0.6	
Scheduling		1.0	
Day target			1.0
Night target			1.1
SLAR			0.7
Aircrew effectiveness			1.0
MEI	1.1	1.0	

converted to these aircraft.* To form reasoned judgments regarding any apparent differences between active and ARF units of various types and the relative importance of the various categories that were measured will require thorough evaluations of additional active and ARF units, an expanded time-frame, and, perhaps, a weighting matrix to relate the significance of each of these peacetime effectiveness measures to potential wartime capabilities. Additional aircraft types can be brought into the analysis as they enter the ARF inventory to evaluate the ability of the ARF to meet the special requirements prescribed for them.

With respect to the capability measures that were used in the above case studies, we, of necessity, had first of all to accept at essentially face value the unit "quality" measures and statistics that are presently being systematically collected. Secondly, the adequacy of the readiness measurement system in use by the Air Force is under investigation, with Rand's Project AIR FORCE assisting in that effort. Some early results of the study have been reported[42] including some additional readiness measures that could be added to our list. For example, ability to generate sorties appears to be superior in certain respects to the simple OR rate. Other measures may emerge from that study that will prove useful in future comparisons of active and ARF capability.

It is our strong impression, however, based not only on the above case studies but also on information obtained during our extensive visits to reserve bases and on the general statistics shown earlier in Tables 14 through 17, that there are no *inherent* limitations in ARF military capability other than those that result from constraints on participation levels--number of programmed man-days and flying hours. Although a review of relative active and ARF capabilities in common

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*It should be observed that the two measures for which the ARF units were shown to be inferior (average flying hours per crew in the UE aircraft, and aircraft maintenance) are time-dependent. That is, because of the low turnover in ARF aircrews and maintenance Technicians the ARF scores can be expected to improve the first few years following conversion.

mission areas is an essential part of the tradeoff analysis, we feel that the key to understanding any ARF shortcomings and to ranking ARF-preferred missions is the DOC limitations that are built into the ARF annual training program because of the lower ARF activity levels.

The DOC that has been developed for each aircraft consists of a series of events in which the aircrews are to be qualified and the expected number of sorties needed to accomplish the necessary preparatory training. Table 48, for example, compares the RF-4C DOC requirements prescribed for the active and ARF squadrons. In a six-month period, the active crews are expected to perform 72 sorties and the ARF crews 48. Put differently, the ARF RF-4C crews would have to increase their number of sorties by 50 percent to accomplish the complete DOC *given these standards*.

Assuming that the number of additional sorties could be translated without undue difficulty into flying hours and man-days, it would be a simple matter to compute the additional cost implied by such an enhanced flying program using the FORCE cost model. Although this might be regarded as a straightforward way to make cost-effectiveness tradeoffs between "equivalent" active and ARF units, we think several observations are in order. First, a significant increase in reservist participation rates above the present level probably is infeasible.* It must be recognized that a reservist with a full-time job elsewhere has only so much free time to devote to his part-time military career. Second, it may be possible to meet the DOC requirements short of the large activity increases implied by the DOC standards. Some examples are suggested by reference to our case studies.

In a footnote to the employment capability section of the A-7 case study, we quoted ANG staff officers who asserted that their crews could become proficient in the complete DOC (including night gunnery) without significant additions to the flying-hour allocation. They only required some additional flare facilities plus about four additional flying hours

*The air defense alert mission requires a higher than normal participation rate by the interceptor aircrews, but the tasks are largely of a standby, relaxed nature and are not remotely comparable to flying additional DOC training sorties.

and three classroom hours for initial qualification. This assertion could easily be tested.

In the RF-4C case study, it is interesting to note that the ORI scores for the ARF unit (see Table 55) indicate that this particular unit outdid its active counterpart in night target effectiveness with less than half as many training sorties in this mission area (10 versus 26--see Table 48). This suggests a hypothesis that is worthy of examination: that DOC standards were developed using active force training experience and the sorties allowed for qualification had to be sufficient for the inexperienced crews that are quite prevalent in the active force. Since most ARF crews are highly experienced, they may require far fewer hours to qualify in the full DOC than the standards recommend. The logic of this hypothesis argues against the "straightforward" cost-effectiveness tradeoff described above, at least until the possibility of adding DOC requirements to the ARF annual training program, without adding flying hours, has been examined.

A final observation on the DOC limitations question involves the proposition that there may be certain DOC requirements that can be met without *every* crew in *every* squadron--active and ARF--having to qualify. Although the complete DOC for all crews might be a desirable goal, it was noted in the C-130 case study that only three crews were required to be qualified in certain DOC events even in the active units. It is our understanding that reduced fuel allocations have forced a degree of crew specialization (a partial DOC) in some of the active squadrons equipped with multimission tactical fighter aircraft. These examples suggest that ARF units may be able to attain at least minimum requirements by means of specialization, either by units (e.g., in the manner of the ANG RF-4C program, which emphasizes the day DOC requirements in some units and the night requirements in the others) or by specialization *within* units. Every ARF flying unit has some full-time rated Technicians* who could undertake added DOC requirements that can be satisfied with only a portion of the unit becoming fully qualified.

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*And some reservists who are willing to devote more time to training than others.

In summary, we believe that reservists are competent to qualify in any of the Air Force's missions, subject only to the hours they are willing to devote to training from their limited amount of free time. This tends to translate into DOC limitations, but they probably are less than would be supposed by an inspection of the sorties-per-event figures that are expressed in the DOC standards. It might be advisable to give reserve headquarters personnel a greater voice in the development of training programs that could be tailored to the ARF's special characteristics. The gaining commands could state their requirements, leaving it to the ARF to determine how best to achieve them.

Although a limited number of additional flying hours and man-days may be feasible* (if this is necessary for DOC enhancement), we suspect that this approach could not be carried far without undesirable effects on recruitment and retention. What probably will remain for the force mix tradeoff analyses are ARF units with lesser costs than similar units in the active force, but (in some cases at least) also with somewhat lesser military capabilities. The purpose of the analyses will be to determine which missions/aircraft provide the preferred tradeoff between cost savings and diminished capability.

One final consideration in the force mix deliberations affects reserve units as a whole and must remain judgmental. It concerns response time. We were informed that ARF units are trained to mobilize and deploy in 72 hours or less. However, we also are aware of the political constraints and long-run recruitment and retention considerations that inhibit an ARF mobilization for other than clearly unambiguous military threats to our national security. The failure to use reservists extensively in the Vietnam War could be interpreted as a return to the policy of utilizing reserves only in a complete mobilization.† However, the testimony of ARF spokesmen before Congressional armed services committees, ARF support for the law to permit the President to mobilize 50,000 reservists without a declaration of a national emergency, and the Congressionally supported total force policy are clear indicators of the

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*The procedure for calculating the cost implications of increased flying hours is discussed in Sec. III of Ref. 1.

†Reference 17, p. 20.

intent, as well as the ability, to rapidly integrate the active and reserve forces when the situation demands it. It seems reasonable to assume that reservists who belong, voluntarily, to units that must mobilize and deploy within 72 hours are prepared to do that. Although there is no denying that ARF units are inherently less available than units in the active forces, the total force policy has significantly reduced the expected response time differences between them, certainly in the event of an outbreak of a major war--when an immediate response really counts.

In this section we have described some approaches that could be used by Air Force planning staffs to compare the military capabilities of similarly equipped active and ARF flying units preparatory to making force mix tradeoffs. In the next section we discuss ways in which the ARF might alter some of its policies and operational concepts with potentially beneficial effects on the Air Force budget.

VI. ENHANCEMENT OF ARF EFFICIENCY

At the outset of this study a spokesman for the reserves remarked that the ARF operates 40 percent of the Air Force's squadrons with 5 percent of the budget. While this statement can be verified as true in some sense, it is, of course, a half-truth. First, the air reserve program cost of $1.6 billion includes no R&D and no major equipment procurement, which together account for more than 40 percent of the Air Force budget. Second, it must be remembered that the ARF is an add-on to an active force structure which includes the command echelons and vast tactical, logistic, and training support infrastructures. This is not to suggest that the budgetary savings generally attributed to the reserve forces are illusory; we have found them to be, in fact, very impressive. We have also found, however, a number of ways in which ARF costs could be made still lower with no sacrifice in total force augmentation capability. These issues are discussed in turn below.

TRANSITION UNITS

During the course of our investigations, we found units retained in the ARF whose principal value seemed to be in sustaining an organizational entity and skilled resources from which to reconstitute a viable weapon system when new equipment becomes available. Though assigned to the ARF, these *transition units* should not be regarded as a saving, in the same sense that an ARF A-7 unit represents a saving when compared with the cost of one in the active forces. To the extent that they currently possess little or no wartime utility as active force augmentation, these transition units are, to the contrary, an *added cost*.

The modernization actions programmed for the ARF over the next few years will tend to decrease the number of these transition units, at least temporarily. Nonetheless, given retention of the full 144 unit ARF force structure, a significant number of low-priority units will continue to exist because present procurement levels do not permit the active force to make modern equipment available to the ARF in sufficient quantities. In fact, in the absence of a significant wartime

build-up in the interim, by the mid-1980s this situation may pose far more of a problem than it does today.*

The obvious solution--elimination of transition squadrons in excess of the number that can be modernized within a reasonable period--may not be feasible, for the reasons that were discussed earlier. Alternatively, force planners could explicitly identify lower-priority units as such, and could correspondingly revise or remove their standard readiness requirements. This would enable significant reductions to be made in flying activity. The minimum AFR 60-1 aircrew proficiency requirements ought to suffice to sustain the aircrew and maintenance resources in adequate standby condition. Reservist aircrews, headquarters framework, and Technician resources for peacetime sustaining maintenance and support, commensurate with the reduced flying requirements, would be retained within these lower-priority units; but maintenance and support activities that depend on the continual acquisition of short-career, expensively trained, nonprior-service recruits, would be reduced or eliminated until the receipt of newer equipment is imminent.

These actions would reduce flying hours and the maintenance Technician requirements of these units by almost one-third, and reservist manpower by about one-half. They also should drastically cut recruiting and training costs. Under these conditions, the transition unit would still retain all the essential ingredients for a fairly rapid conversion when this becomes possible, remaining a repository of highly skilled resources in the interim, but at a dramatically lower cost.

An estimate of the level of savings that such a change in policy might yield has been computed by Rand's total force cost model, FORCE.† To derive the estimate we first had to identify the ARF units that might be characterized as transitional. Selection of transition units from the mix of various ARF units must necessarily involve a somewhat subjective appraisal of their wartime military worth. As an illustrative approximation, we categorized such units as the ones with aircraft that

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*By then, even today's first line A-7s and F-4s may be approaching transition status.

†For this application of the model, see Ref. 1, Sec. IV.

the Air Force would be unlikely to retain in the absence of the ARF. The transition units listed in Table 58 were chosen either because their aircraft are not currently in the active inventory or because they are programmed for early phaseout. We recognize that this categorization may not be appropriate for all units having these aircraft types; for example, a limited number of C-7, C-123, or KC-97 units may be considered essential for some contingencies. However, this list will serve to establish a first-cut approximation of the potential savings that this policy change might produce.

Table 58

ARF TRANSITION UNITS

Aircraft Type	Number of Units
F-100	16
RF-101	2
F-105	7
A-37	6
O-2	7
C-7	3
C-123	4
KC-97	8
Total	53

To structure this cost model example, we reduced the annual flying hours for line and overhead crews in squadrons equipped with transition aircraft to 100 hours, the AFR 60-1 minimum required to maintain an administrative or "operationally capable" level of aircrew proficiency. In addition, combat crew training squadrons equipped with F-100s and F-105s were put on standby until their transition to F-4s and A-7s. The effect of these combined cuts is indicated in Table 59. As expected, the flying-hour reduction led to corresponding savings in resources such as POL* and depot maintenance. These account for about

*The benefits of reduced fuel consumption, per se, should not be overlooked.

one-half of the calculated savings. The reduction in personnel costs stemmed primarily from reductions in the aircraft maintenance Technician staff, because their strength is determined on the basis of the peacetime flying-hour levels. The estimated five-year savings from these measures amount to approximately $125 million; more than half of it in 1977-1978, before the F-4s and A-7s begin to phase into the ARF in appreciable numbers.

Table 59

COST SAVINGS FROM REDUCED ANNUAL FLYING HOURS PROGRAMMED FOR TRANSITION UNITS

($ millions)

Cost Elements	1977	1978	1979	1980	1981	5-Year Total
POL	18	11	8	4	3	44
Depot maintenance	5	4	3	2	2	16
Civilians	14	13	10	6	4	47
Other[b]	6	5	4	2	--	17
Total	43	33	25	14	9	124

[a]Flying hours reduced to the AFR 60-1 minimum of 100 hours annually per crew.

[b]Replenishment spares and general and system support material.

In the case of squadrons due for early transition into new aircraft, the potential civilian cost savings are overstated, since it is not expected that maintenance Technicians would be discharged and others recruited a year or so later. If no reductions in Technicians are made in squadrons programmed to convert before 1980, the estimated five-year savings would drop to a still impressive $105 million. On the other hand, the overall savings shown in the table would increase in the years beyond 1979 if other aging aircraft models were added periodically to the transition list and operated at these lower flying-hour levels.

We fully recognize that such actions, however logical they may appear to a detached researcher, would in practice involve a fundamental shift in philosophy. All ARF units are now regarded as the initial and primary wartime augmentation for the active forces. We believe it should be acknowledged that, in fact, a sizable portion of the ARF is, and will continue to be, unprepared for that role, given its present outdated equipment. The ARF transition units constitute, instead, a holding reservoir of organizational structures and skilled resources that provide a framework for future modernizations. If war should come before they are reequipped, their role would depend on the course and duration of the war; but in any event, they would have time to sharpen their flying skills, presumably in newer aircraft, before being deployed. Thus, a reduced flying program in peacetime for these units would have no real impact on their wartime utility.

Looking ahead, it appears that within the next few years the ARF will be composed of a relatively high proportion of units that could be considered, at least marginally, as first-line. Nonetheless, this force, too, will sooner or later be subject to the same technological and operational obsolescence as the current force, declining to transition status until modernization occurs. If the ARF is to retain its status as a cost-effective component of the total force, there must be explicit recognition of the changing cost-benefit rankings of each unit, and this in turn requires a continual reappraisal of ARF costs and capabilities by Air Force planners and programmers.

CIVILIAN MANPOWER AND BEDDOWN

Table 60 shows the civilian manpower assigned to units with aircraft, mission, and UE that are common to the USAFR and the ANG.* The combined Technician/regular civilian manning is distributed among three major functions--operations,† aircraft maintenance, and support--with the number of regular civilians that are included in the USAFR figures

*EC-121 aircraft units were omitted because the USAFR and ANG mission, UE, and flying-hour programs all differ.

†The term "operations" as used here includes the command and administrative functions.

Table 60

TECHNICIAN/CIVILIAN MANNING FOR COMPARABLE ANG AND USAFR FLYING UNITS, BY FUNCTIONAL AGGREGATES

(FY 1976)

Aircraft	Unit	Command	Basing[a]	UE	Operations	Aircraft Maint.	Support	Total[b]
F-105	192 TFG	ANG	COM	24	17	169	68	254
F-105	113 TFW	ANG	AFB	24	25	181	75	281
F-105	301 TFG	USAFR	AFB	24	17	242	38	297 (32)
F-105	507 TFG	USAFR	AFB	24	15	214	32	261 (27)
A-37	175 TFG	ANG	COM	24	15	69	69	153
A-37	174 TFG	ANG	COM	24	18	67	75	160
A-37	910 TFG	USAFR	COM	24	14	91	195	300 (184)
A-37	434 TFW[c]	USAFR	AFB	24	11	89	24[d]	124 (17)
C-130B	145 TAG	ANG	COM	8	35	86	77	198
C-130B	153 TAG	ANG	COM	8	28	85	73	186
C-130B	459 TAW	USAFR	AFB	8	24	101	28	153 (21)
C-130B	920 TAG	USAFR	AFB	8	21	102	25	148 (18)
C-130B	940 TAG	USAFR	AFB	8	20	101	26	147 (19)
C-130B	452 TAW	USAFR	AFRB	8	27	105	271[e]	403 (272)
C-130B	439 TAW[f]	USAFR	AFRB	8	23	98	401[e]	522 (395)
C-130B	926 TAG	USAFR	NAS	8	22	101	95	218 (91)
C-7	170 TAG	ANG	AFB	16	22	67	29[d]	118
C-7	908 TAG	USAFR	AFB	16	19	56	22	97 (16)
C-7	94 TAW	USAFR	AFRB	16	25	54	326[e]	405 (323)

SOURCES: Ref. 43 and computer listing dated July 1975 from National Guard Bureau, Office of Technician Personnel.

[a]Base types: AFB--active AF base; COM--commercial airport; AFRB--USAFR host base; NAS--naval air station.

[b]Figures in parentheses are regular civilians included in USAFR totals.

[c]45 TFS operations and maintenance.

[d]Two-squadron base, with shared support.

[e]Total host support, including support of other units.

[f]439 TFW has both a C-130 squadron and a C-123 squadron. The 439 TAW operations and maintenance figures in the table are limited to the C-130 share.

shown in parentheses to the right of the USAFR totals. Aside from a few clerical positions in the operations and maintenance categories, the regular civilians are all assigned to base support functions.

Several observations may be made about these figures: First, with regard to the manning distributions among units of the same type in each reserve component, in almost every case (the C-7s being the exception) the USAFR puts proportionately more of its civilian work force into aircraft maintenance. Since annual flying hours are closely

comparable for corresponding kinds of units of the ANG and USAFR,* the rationale behind this divergence in the allocation of civilian manpower is not clear. However, if the USAFR has discovered a formula for performing its operations and support functions with fewer full-time people than the ANG, and ANG units seem capable of meeting their flying training requirements with fewer full-time maintenance personnel than comparable USAFR units, there may be some merit in evaluating these policies to see if some manpower-saving measures are being overlooked on both sides.

The explanation for the lower operations and support manning of the USAFR units seems to lie in the fundamental difference in policy between the two reserve components in the assignment of personnel on active Air Force bases. Although the ANG full-time support strength is not influenced noticeably by base type, the USAFR sharply reduces its support manning for units located on active Air Force bases. Unlike the ANG, the USAFR tenants rely upon their host to provide support services such as security and transportation. These the host can furnish at marginal rates, since the services already exist. Some host add-on costs seem inevitable, but these cannot be very large; close questioning of manpower planners both at Headquarters USAF and at the many active Air Force bases we visited failed to uncover any hard data on the proportion of host support manning that is attributable to the support of reserve tenants. Our cursory functional analysis suggests an augmentation of no more than 20 people for host support of the tactical elements of an average-sized USAFR flying unit. FORCE cost model examples reveal that, relative to beddown on commercial airports, the use of active Air Force bases could save the ARF about $0.6 million in civilian costs annually per flying unit, considering the tactical elements alone. If the full reservist organization, including collocated support organizations, is taken into account, the annual

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*Again, the C-7s are the exception; the ANG C-7 unit has about 10 percent more flying hours annually than its USAFR counterpart. This probably accounts for some of the higher-than-expected maintenance manning in the ANG unit.

savings could approximate $1 million for each group.* This assumes that the reserve units make full use of available host support services.

These potential support manpower savings argue in favor of an active Air Force base beddown for reserve units provided the necessary population base exists.† Similarly, locating more than a single reserve unit at a given location results in noteworthy support economies, as is evidenced by the figures in Table 60 that are keyed to footnote d.‡ This phenomenon is operable for multiunit reserve beddowns, provided that only one reserve component is involved; these manpower economies of scale do not cross ANG/USAFR lines.

Another divergence in ANG and USAFR policy concerns the manning of the civilian work force that performs day-to-day base support functions in peacetime. The ANG assigns Air Technicians** who, it will be recalled, are also reservist members of the organizations. The USAFR, on the other hand, satisfies its peacetime support requirements with a separate group of civil service employees ("regular civilians") who are under no obligation to belong to the reserve organizations.

For support functions that have a wartime deployment requirement, e.g., those included in the mobility support flights, the ANG approach has an obvious appeal: The combined Air Technician-reservist pay should attract higher caliber, career personnel whose presence would reduce the recruiting, retention, and training burden of the units. There also may be some essential support requirements during drill weekends that exceed the capabilities of the mobility support flights and which can be performed more cheaply by reservists than by civilian employees.

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*For details, see Ref. 1, Sec. III.

†The requirement for at least one ANG flying unit in each state constrains the number for which Air Force basing is a viable alternative.

‡We were informed that where more than one gaining command is involved, some Air Force inspection teams object to this comingling of duties for Technician staff members, despite the obvious savings in manpower.

**Exceptions to this rule occur in the manning of support activities on ANGBs which provide host services to a variety of tenant organizations. Regular civil service employees are assigned rather than Air Technicians, and a separate air base group is organized for the purpose.

Any such positions also seem to be well suited to manning by Air Technicians (in their reservist roles) for the reasons stated above. However, the rest of the peacetime support requirements could just as well be filled by regular civilians. Since they also would be available to assist in any unit mobilization, after which they could continue to support the base if it had a wartime mission, it is not clear why their functions should have to be duplicated in the reservist support authorizations. The subject of reservist base support authorizations is addressed at greater length in the next section. Meanwhile, we will just observe that there seems to be an opportunity for substantial savings if regular civilians (alone) are hired for peacetime support, except for those tasks that require both civilian and reservist authorizations. For the latter, the ANG approach seems advantageous.

ARF UNIT ORGANIZATION, MANNING, AND SUPPORT

Within the unit organizational structure defined by the gaining and custodial command, manpower authorizations for ARF units are developed in accordance with standard manpower management methods. The peacetime military manpower authorizations are a reflection of wartime (mobilized) requirements that, in turn, are based on (1) the planned wartime sortie and/or utilization rates for each aircraft type, (2) the man-hours required to support such rates, and (3) the assumed wartime availability and productivity of the aircrews and other personnel. As the wartime missions, and hence the planning standards, should be essentially the same for active and reserve units equipped with the same aircraft, one might expect that their manning also would be about the same. However, in Sec. V we commented on the rather significant divergences in active and ARF unit manpower because of differences in their beddown, UE, crew ratios, maintenance manning assumptions, and other influences. One of the activities in which the ARF units were consistently found to have a proportionately greater concentration of military manpower was base support. In this section we focus on the characteristics and the justification given for these resources.

We have compiled, in Table 61, a set of typical USAFR and ANG units (i.e., groups or wings*), each of which is arrayed by its principal organizational elements. To simplify the table, specialized support elements such as aerial port and aeromedical evacuation flights have been excluded from the totals; their inclusion would not contribute to the comparisons.

For aircraft possessed by both the USAFR and the ANG, we have included typical units from each component. Also, where beddowns vary for a given aircraft type, representative units of each type are shown to illustrate manning differences as a function of basing (e.g., ANG base, AF base, commercial airport, etc.). The column showing mobility total for each unit indicates the total military manning applicable to operation, maintenance, and incremental support of the flying unit. The remaining elements (combat support,† civil engineering, communications, medical), although subject to mobilization, are not required for support of the parent flying unit and are not deployed with it.‡ The mobility support flight consists of the deployable combat support resources** that are needed to augment the active base to which the flying unit deploys in wartime. It provides the base operating support supplement required to support the deployed forces on the forward base.

The concept of the mobility support flight was not envisioned when the combat support, civil engineers, communications, and medical elements were first attached to ARF flying units. At that time it was assumed that ARF units would deploy to austere bases in wartime and this would require a high degree of unit self-sufficiency. When this view was officially abandoned in favor of the more realistic assumption that

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*The wing totals include only their collocated mobility and support elements.

†Called "air base squadrons" in USAFR associate units.

‡This statement does not apply to units that mobilize in place, e.g., air defense interceptor squadrons. They require their support elements and, in fact, do not have mobility flights.

**An average mobility support flight includes the following manning authorizations: accounting and finance (1); personnel (1); unit level support (18); fuels management (7); transportation (7); vehicle maintenance (4); food preparation and service (8); disaster preparedness (1); medical (4) (Ref. 44).

Table 61

MANPOWER AUTHORIZATIONS OF SELECTED ARF UNITS BY AIRCRAFT AND BASE TYPE

				Mobility Elements							"Other" Support Elements					
Aircraft	Unit	Command	Basing	UE	Wing/ Group Hq.	Flying Sq.	CAM Sq.	MS Flight	WSS Flight	Mobility Total	Combat Support	Civil Engr.	Communi-cations	Medical	Support Total	Grand Total
F-100	127 TFW[a]	ANG	ANGB	18	73	40	279	56	37	485	198	85	29	39	351	836
F-100	131 TFW[a]	ANG	COM	24	76	49	368	56	46	595	248	92	29	39	408	1003
F-100	149 TFG	ANG	AFB	24	40	49	363	56	46	554	190	85	29	26	330	884
F-4	183 TFG	ANG	COM	18	41	63	396	56	37	593	201	92	29	26	348	941
F-105	113 TFW[a]	ANG	AFB	24	74	49	494	56	46	719	225	85	29	39	378	1097
F-105	507 TFG	USAFR	AFB	24	40	49	487	55	46	677	72	85	29	25	211	888
F-105	192 TFG	ANG	COM	24	41	49	499	56	46	691	195	92	29	26	342	1033
A-7	140 TFW[a]	ANG	ANGB	18	77	41	314	56	37	525	230	92	29	39	390	915
A-7	169 TFG	ANG	ANGB	18	41	41	299	56	37	474	195	92	29	26	342	816
A-7	150 TFG	ANG	AFB	24	41	50	413	56	46	606	187	85	29	26	327	933
A-37	174 TFG	ANG	COM	24	40	49	219	56	46	410	229	90	29	26	374	784
A-37	917 TFG	USAFR	AFB	24	40	48	217	55	46	406	53	85	29	25	192	598
A-37	910 TFG	USAFR	COM	24	40	48	217	55	46	406	175	90	29	25	319	725
RF-4	187 TRG	ANG	COM	18	41	157	308	59	37	602	237	92	29	26	384	986
RF-101	186 TRG	ANG	COM	18	40	131	280	59	37	547	200	92	29	26	347	894
KC-97	160 ARG	ANG	AFB	8	39	78	220	56	21	414	189	85	29	26	329	743
KC-97	171 ARW[a]	ANG	COM	8	71	78	220	56	21	446	193	85	29	39	346	792
KC-97	136 ARW[a]	ANG	NAS	8	71	78	226	56	21	452	230	85	29	39	383	835
C-130A	133 TAW[a]	ANG	COM	8	72	72	191	45	21	401	229	90	29	39	387	788
C-130A	934 TAG	USAFR	COM	8	39	76	197	41	21	374	200	90	29	25	344	718
C-130A	157 TAG	ANG	AFB	8	39	72	191	45	21	368	172	85	29	26	312	680
C-130B	940 TAG	USAFR	AFB	8	39	76	197	41	21	374	55	85	29	25	194	568
C-130B	926 TAG	USAFR	NAS	8	39	76	197	41	21	374	99	90	29	25	243	617
C-130B	153 TAG	ANG	COM	8	39	72	191	45	21	368	189	90	29	26	334	702
C-7	908 TAG	USAFR	AFB	16	37	86	136	60	31	350	46	85	29	25	185	535
C-7	170 TAG	ANG	AFB	16	37	82	136	64	31	350	172	85	29	26	312	662

SOURCES: Refs. 5 and 6.

[a]Collocated units only.

they would deploy--like active units--to existing Air Force bases, it was decided to retain the "other" support units against other possible post-mobilization requirements of the Air Force. Meanwhile, in peacetime they would be available on UTA weekends and during active duty training to reinforce the mobility support flights. In the event of mobilization they could augment the Technician/civilian support work force and the mobility support flights to assist the mobility group until it deployed. This, at least, was the overall concept that emerged.

Table 61 shows the relative importance, in terms of manpower, of the mobility group compared with the support elements (shown to the right) that are excluded from it. The civil engineering, communications, and medical categories are quite uniform in size. Combat support, on the other hand, exhibits pronounced strength variations (in the case of the USAFR) depending on beddown: roughly 200 on commercial airports, 100 on naval air stations, and 50 to 75 for active Air Force bases. ANG combat support elements, it will be noted, all are of large sizes, averaging about 200 regardless of base type.

During our visits to numerous ANG and USAFR installations we attempted to gain a clearer understanding of the value of these other support resources that, in the case of many ANG units, account for more than 40 percent of reservist strength. Some of the responses to our questions concerning what they normally do during UTAs (train in their specialties) and what they would do during the brief period now anticipated for the mobilization and deployment of the mobility groups (add to the processing problem) suggest that rather than being an asset to their parent units, these support elements, in some cases at least, may constitute an added burden.

At some installations we were told of instances where these support personnel were put to productive work occasionally during UTAs; for example, installing telephones, clearing a field, performing clerical work, cooking meals, and helping with the periodic physicals that are required. While so engaged, the reservists probably perform the services at less expense than would be required to engage private contractors for the work. But eating establishments are readily available

on or near airports and air bases and infrequent support services may be performed by contractors at less cost than the annual pay bill for the in-house standby capability represented by the ARF support elements. As was observed earlier, the availability of host support on active Air Force bases produced notable savings in USAFR support manpower. In airlift units, the two-week annual active duty encampments are being supplanted by single-day events, scheduled over the course of a year at the convenience of the individual aircrews. But even in the case of flying units that deploy each summer away from their home stations, it was called to our attention that any support personnel that go along are limited to those assigned to the mobility support flights. Like the UTAs, the active duty training periods appear to offer little justification for the non-mobility support elements. Headquarters USAF has indicated its interest in ARF civil engineering resources, however, by funding two-week annual encampments for them at centralized training grounds.

Since active Air Force units would be the first to be deployed in a war situation, it seems likely that active duty support personnel could be made available to assist in the subsequent mobilization of tenant ARF units. And on commercial airports, where many of the required support services of local ARF units are provided under service contracts, it may be possible to amend the contracts to provide for additional services that might be needed during mobilization. The large work force of ARF Technicians and civilians would, of course, provide the major share of mobilization support, augmented by the mobility support flight personnel, whose function is to furnish just such reinforcement.

With regard to the justification of the non-mobility support elements because of their wartime potential, it should be observed that some analysts question the wisdom of maintaining in the reserve forces those support activities whose needs could be met from the civilian labor force after mobilization began, e.g., medical, legal, construction, and administration.* We take the view that if there is a valid need for such support in a hurry, the reserve structure does provide a cost-effective means of preserving that capability. In past mobilizations,

*Reference 17, p. 34.

reserve support personnel have, in fact, been used as fillers for Air-Force-wide requirements. To the extent that such requirements exist, reservists--particularly those with prior service--are a bargain compared with full time active duty support personnel. But they are not free, and the post-mobilization requirements for reserve support personnel should be carefully reviewed in the light of their year-after-year drain on the Air Force budget.*

The large combat support force (20,000 in the ANG, 3400 in the USAFR)† is not only costly in the budgetary sense but it also imposes upon each ARF unit a significant recruiting and training burden. In effect these support authorizations compete with the essential operations and maintenance authorizations for available people from the local manpower pool.

In the same vein, there are large numbers of civil engineering flight authorizations (8200 in the ANG and 2500 in the USAFR)† whose function is separately justified for active force augmentation by Headquarters USAF, and who exist in peacetime within the ARF unit structure for convenience rather than necessity. Thus, the total of about 34,000 combat support and civil engineering authorizations throughout the ARF make it necessary for each unit to recruit and train significantly more people--250 to 300 in many instances--than are required to support the flying units. Inasmuch as this intensifies the

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*We performed a simple excursion of the FORCE cost model to identify the cost savings achievable if all of CSS authorizations were deleted except those of ANG interceptor squadrons, which were assumed to mobilize in-place. The results depicted not only the annual direct savings in pay, but also the ripple effects in other cost categories such as training and base operating support. See Ref. 1, Sec. IV.

Activity	Annual Cost Savings ($ millions)
USAFR combat support	8
ANG combat support	45
Base operating support	10
Training (student costs)	6
Air training command	2
Total	71

†See Table 4.

recruiting problem and limits the number of population centers that can support ARF units, we conclude that the collocation of these support elements with the flying units as a matter of policy may, on balance, be detrimental to the primary mission forces. To the extent that these support resources are essential for some wartime requirements, consideration should be given to centralizing them near the larger population centers, freeing the flying units to staff a significantly smaller group of about 500 people.

GRADE STRUCTURE

Grade structures are imposed on ARF units by means of a unit detail listing issued by the active gaining command. UDLs identify the positions and the grade structure for each in a standard organizational structure. From the outset of our research we encountered strong feelings at the unit level that the imposed grade structure is inappropriate to the special needs of the ARF because it hampers recruitment and retention of experienced prior service people in many cases. During our visits to the ARF units, many commanders expressed the belief that they could staff their units with greater efficiency if they were given some authority to adjust the grade structure demands to the supply constraints of their particular recruitment pool.

Prior-service people normally leave the active force with a grade of E-4 or E-5 and are understandably reluctant to enter an ARF unit at a lower grade, or even at the same grade if the prospect of grade advancement is slim. As a result the units frequently find it necessary to recruit an inexperienced nonprior-service man to fill one of the lower grades, even though experienced prior-service people would have been willing to join if there had been a higher grade vacancy. When we raised this issue at the headquarters of the active gaining commands we encountered strong opposition to any notion of "grade relief" for the ARF units because: (1) upon mobilization a top-heavy enlisted grade structure in the ARF would result in serious imbalances within the integrated force, and (2) ARF units already exceed the manpower grade authorizations found in the active forces.

To verify the second contention, we examined the grade authorizations of active and ARF work forces in similarly equipped units. Table 62 shows two such comparisons of the enlisted maintenance grade authorizations within A-7 and C-130 units.

Table 62

COMPARISON OF ENLISTED MAINTENANCE MANPOWER GRADE AUTHORIZATIONS IN USAF AND ARF UNITS

	A-7 Unit[a]				C-130 Unit[b]			
	USAF		ANG		USAF		USAFR	
Grade	No.	%	No.	%	No.	%	No.	%
E-9	5	0.44	6	1.47	9	0.54	3	1.61
E-8	12	1.07	9	2.21	18	1.08	3	1.61
E-7	67	5.96	29	7.13	78	4.69	11	5.91
E-6	106	9.43	81	19.90	141	8.48	31	16.67
E-5	232	20.64	103	25.31	324	19.49	51	27.42
E-4	329	29.27	109	26.78	478	28.74	59	31.72
E-3	373	33.19	70	17.20	615	36.98	28	15.06
Total	1124	100.0	407	100.0	1663	100.0	186	100.0
Mean Grade	4.3		4.9		4.2		4.8	

[a]USAF: 23d Tactical Fighter Wing organizational, avionics, field, and munitions maintenance squadrons; ANG: 150th Tactical Fighter Group consolidated aircraft maintenance squadron.

[b]USAF: 314th Tactical Airlift Wing organizational, avionics, and field maintenance squadrons; USAFR: 926th Tactical Airlift Group consolidated aircraft maintenance squadron.

To the extent that these specific unit comparisons are typical, it appears that the ARF grade authorizations are indeed somewhat higher, by about 14 percent, than those of similarly equipped active units. Despite this apparent advantage, about 45 percent of the ARF grade authorizations are in the lower grades, and this is the portion that necessitates recruitment of nonprior-service people, even though, in many cases, valuable prior-service persons are locally available. Aside from the problem of grade imbalance upon mobilization, it appears

that from the standpoints of both cost and capability it would be advisable to attract the more experienced, career-oriented people whenever possible.

Assume, for purposes of illustration, that the ARF unit grade structures shown in Table 62 were revised to provide additional E-5 slots to replace the E-4 and E-3 slots. This would involve upgrading, for the two units, 168 E-4 slots to E-5, and 98 E-3 slots to E-5. The average annual reserve pay increase for the E-3 upgrade is approximately $330 per man, and for the E-4 upgrade it is $220 per man,* for an average upgrade cost of $260 per man.

If this upgrade policy were effected, the added average pay per man would be more than offset by the avoidance of initial costs associated with nonprior-service recruits but not generally with prior-service recruits. Recruitment, travel, initial clothing allowance, basic military training, and pre-technical training costs exceed $3600 per man, and technical school training cost for most aircraft maintenance specialties is from $7000 to $13,000 per man. Thus, to the extent that the increased grade authorizations can attract prior-service recruits, the effect of the pay differential on the annual budget would be insignificant compared to the recurring initial training costs of inexperienced, nonprior-service persons.

When a recruit without prior-service experience completes basic military training and, in most cases, formal technical training, he joins his unit for the remainder of his six-year enlistment, during which time he is available about 40 equivalent 8-hour days per year for military and on-the-job technical training, and for administrative and medical obligations. For most of his initial enlistment he is a net consumer of training, which is to say he is a drain on the productive potential of the unit,(45) and at the conclusion of the six-year tour his retention probability is considerably lower than that of the typical prior-service individual.†

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*Assuming 62 drills/active duty man-days, the average annual base pay for a reservist E-3 is about $870, E-4 is $980, E-5 is $1200.

†Our retention experience with nonprior-service recruits is based on the draft environment and may not accurately reflect the purely

In an earlier effort[46] to gain insights into the relative worth or productivity of maintenance airmen with and without prior-service experience, we conducted two parallel inquiries, one in the form of a questionnaire administered to the chiefs of maintenance in 21 USAFR and ANG units, and the other in the form of a multivariate regression analysis of operational and maintenance data compiled over a six-month period from 58 ARF units.

The purpose of the questionnaire survey was to quantify general productivity issues related to ARF enlisted maintenance manning and to measure differences among three labor categories: Technicians, prior-service and nonprior-service recruits. Maintenance officers were asked to assess these three groups in terms of ability, productivity and motivation on a scale of 1 to 7 (see Table 63).

Table 63

MAINTENANCE OFFICERS' ASSESSMENTS
OF RELATIVE PRODUCTIVITY

Area of Assessment	Technician	Prior-Service	Nonprior-Service	Sample Mean
Ability	6.33	5.24	4.33	5.30
Productivity	5.86	4.76	3.85	4.82
Motivation	5.48	5.10	3.43	4.67

We then asked the maintenance officers what labor category tradeoffs they would be willing to make *without sacrificing operational capability*. Specifically, they were asked to estimate the numbers of prior-service or nonprior-service personnel they would be willing to lose to gain an additional Technician, other things being equal. The average response indicated a trade of 1.7 prior-service or 2.9 nonprior-service persons for one Technician--the implied tradeoff is approximately 1.7 non-prior-service person for 1 prior-service person.

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volunteer recruit. On the other hand, in the absence of the draft, the choice may well be between nonprior-service persons of higher grade level or nobody.

The regression analysis, which was based on DMMH/FH expenditures across the 58 diverse flying units, indicated that, on the basis of relative maintenance productivity, one prior-service airman is worth 1.5 nonprior-service airmen, which seems to support the subjective evaluation of the maintenance officers as expressed in the questionnaire survey.

While neither result can be considered a rigorous determination of relative productivity, the fact that they both closely support our intuitive appraisal leads us to conclude that the unit capability can be maintained at a constant level with significantly fewer manpower authorizations if the tradeoff mentioned above is made in the approximate ratio of about 1.5 for 1.

While we have not inquired of the gaining commands whether their opposition to the grade restructuring propositions (i.e., upgrading E-3 and E-4 slots to E-5 slots to facilitate recruitment and retention of available prior-service personnel) would be withdrawn if such upgrading were accompanied by a reduction in total manpower (for example, trading the 266 E-3 and E-4 ARF slots of Table 62 for 117 E-5 positions), we think the approach is worthy of serious consideration.

Table 64 shows the results of a FORCE model run in which the base pay factor for reservist airmen was increased to reflect an E-5 minimum grade equivalent. Recruit training and basic technical training were reduced almost to zero.* This estimate is an a fortiori case in the sense that no credit is taken for increased productivity and consequent lower manning requirements. Even with this constraint the financial attractiveness of the policy change is clearly indicated by the model results, where the reservists and their pay† are tabulated, and air training command savings attributable to the reduced reserve training requirements are computed. These training savings would overwhelm the increased pay costs. The total net value of these savings is estimated at about $25 million a year.

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*We assumed a reduced turnover rate of 10 percent, with only 5 percent of the replacements needing recruit and basic technical training.

†Including trainee pay, subsistence, and travel expenditures.

Table 64

ESTIMATED ANNUAL NET SAVINGS FROM ARF GRADE RELIEF AND REDUCTION IN BASIC TRAINING OF NONPRIOR-SERVICE RECRUITS

($ millions)

	USAFR	ANG	Total
ARF pay increase[a]	+5	+10	+15
Recruit training (student cost)	-14	-17	-31
ARF net savings	-9	-7	-16
Air training command savings	--	--	-10
Total net savings	--	--	-26

[a]About 40 to 45 percent of reservist airmen assigned to units are authorized pay grades E-1 to E-4. Upgrading to E-5 raises *their* pay by about 30 percent. However, overall, the average airman base pay per manday is increased by only 10 percent, from $19 to $21.

UNIT CONSOLIDATION

Because of the minimum amounts of specialized personnel, facilities, and equipment that are needed at each separate operating location, there are cost economies associated with having fewer but larger flying organizations. Yet the ARF force structure contains six F-106 squadrons equipped with 15 aircraft each, having the same capability (at higher cost) as five squadrons equipped with the normal ADCOM UE complement of 18. ARF fighter squadrons typically have 18 UE aircraft, whereas the actives typically have 24. Only three of the 30 ARF C-130 squadrons have 16 UE, the balance being, in essence, half-squadrons of 8 UE each. Each 8 UE squadron is separately based and has its own contingent of support organizations and self-sufficient maintenance squadrons. Table 65 contrasts the manning and cost of a pair of 8 UE C-130 squadrons with those of a single squadron with 16 UE. Both have essentially the same wartime military utility--except for any benefits that may accrue from the additional rated personnel in the duplicated wing/group overhead structure. Because of the additional personnel in administration and support functions that are necessitated by the two

Table 65

COMPARISON OF THE ANNUAL COST OF TWO 8 UE C-130E ARF SQUADRONS WITH ONE 16 UE SQUADRON

Cost Element	1 8 UE Squadron	2 8 UE Squadrons	1 16 UE Squadron	Difference[a]
Manpower				
Officers	80	160	131	29
Airmen	306	612	545	67
Total military	386	772	676	96
Maintenance Air Technicians	75	150	123	27
Other Air Technicians	83	166	118	48
Total Air Technicians	158	316	241	75
Annual flying hours	4017	8034	6609	1425
Annual costs ($ millions)				
Personnel-related	$4.1	$8.2	$6.6	$1.6
Military	(1.6)		(2.7)	
Air Technicians	(2.5)		(3.9)	
Aircraft-related	$3.3	$6.6	$5.7	$0.9
UE costs	(0.8)		(1.6)	
Flying-hour costs	(2.5)		(4.1)	
Total	$7.4	$14.8	$12.3	$2.5

[a]Two 8 UE squadrons less one 16 UE squadron.

separate bases, and also because of the additional flying hours of the rated overhead personnel, the two half-size C-130 squadrons exceed the annual cost of the single 16 UE squadron by $2.5 million.

During the course of this study we visited more than 20 reserve flying units. At each base we visited we asked the commander and his staff whether they thought another unit, or an expanded unit, could be supported there. Aside from the already-large associate wings, the reply was almost always affirmative. Although it might be supposed that the limiting factor in sizing ARF squadrons is the local population base, in fact there are several bases with more than a single "undersized" squadron. Recently, three pairs of 8 UE C-130 squadrons were consolidated into three with the more economical 16 UE strength. Another base (Minneapolis-St. Paul) has two 8 UE squadrons of C-130s--but one belongs to the USAFR and the other is an ANG unit. Usually,

however, the collocated squadrons are of different types: Pittsburgh, for example, has A-7D, KC-97, and C-123 squadrons--each with separate overhead and support organizations. The argument that such duplication is necessary to present a variety of aircraft types to fully tap the varied backgrounds of a given area's manpower base is refuted by the frequent changes in missions assigned to the various bases, regardless of previous experience (such as from F-102 to O-2A and from F-101 to KC-135).

Although some local areas have proven capable of supporting the very large 2000 to 3000-man strategic airlift associate wings, it also is true that some regions have such a small manpower pool that their state units are largely manned by outsiders. However, even those latter organizations might be able to handle more aircraft if they no longer had to recruit unneeded support personnel.

Obviously, the requirement that at least one ANG unit be located in each state limits the opportunity somewhat to prune and consolidate undersized units. Nevertheless, to the extent that consolidation can be achieved in the ARF, dollars can be freed for more productive uses.

Certainly, except for unusually isolated locations where local communities are hard-pressed to support even the present unit of reduced size, the concept of augmenting existing under-strength squadrons should always be considered ahead of the establishment of new squadrons, with the implied duplication of overhead and attendant expenditures on base facilities, runway extension, erection of barriers, etc.

IMPACT OF FLIGHT SIMULATORS

There is a new development in aircrew training that could have a significant impact on active/ARF cost-effectiveness comparisons in the future, particularly if the present organizational structure and beddown of ARF units must be preserved. The new development is the high-fidelity, full mission flight simulator, which is reputed to portray certain combat maneuvers and mission profiles more realistically than is possible in actual aircraft because of the safety and environmental precautions that must be obeyed during CONUS flights in peacetime. This new technology appears to be of greater potential benefit to the active

forces than to the ARF because of the more favorable aircrew availability and basing posture of active units.

Active duty crews presently have more time available for training than they can use, because of aircraft availability problems and restrictions on the use of fuel. Reserve crews, on the other hand, spend a much greater proportion of their on-duty time in the cockpit than active crews do, and any added simulator training probably would translate into added man-days (for which they would receive additional pay).

Although some of the training benefits of simulator training for active duty crews are to be offset by reductions in their aircraft flying hour allotments, even this has a favorable aspect: It reduces the annual operating costs of the active units. Reserve crews already fly much less than active crews; therefore, it is not certain that the reserve crews could accept a further cut in actual flying training to fit the simulators into their present duty schedule.*

The dispersed beddown of the ARF is a distinct disadvantage in the implementation of a flight simulator training program. One simulator on an active base can provide training for an entire wing, given the present plans to operate them day and night and on weekends. A simulator on a typical reserve base, with a single flying squadron, would benefit far fewer crews and it would be idle much of the time. It also would increase the required number of simulators by a factor of 4 or more.† Because of the great expense of sophisticated simulators, assignment to single-squadron reserve bases may be precluded. Yet the alternative approach of sending crews to train on centrally located simulators implies added pay, travel, and per diem expense.

In earlier sections of this report we have given a number of reasons for consolidating ARF flying units into a more compact, economical force. It is not an impossible objective: There presently

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*If they could, their flying hour cuts might yield greater savings than comparable cuts in active duty training because of possible reductions in the number of Air Technicians who maintain reserve aircraft in peacetime. (See Ref. 1, Sec. III for a discussion of the effect of flying-hour changes on annual operating costs.)

†An active wing of 72 UE aircraft compared with 4 ARF squadrons, each with 18 UE aircraft; ARF C-130s are even more dispersed.

are many ARF bases with more than one squadron, but they usually are equipped with different aircraft; this could be changed. Most ARF bases presently are utilizing a large part of the local recruiting base to man support elements that are not needed for the operation of the flying unit; many could be retrained to provide support for additional aircraft. Acquiring aircrews never seems to present a recruitment problem. If the flight simulators fulfill the expectations expressed above, the ARF may have another powerful incentive to consolidate its forces in order to preserve its cost advantage over the active forces.

VII. CONCLUSIONS

The descriptive documentation, analysis and evaluation, and subjective material presented in the preceding sections have brought us to two major conclusions:

- The Air Reserve Forces today collectively constitute a highly motivated, experienced, and generally effective augmentation to the active force.
- The usefulness of the ARF during the 1980s and beyond could be very greatly enhanced by timely recognition and resolution of several extant problems in equipping and manpower policies.

The balance of this section amplifies the latter conclusion by identifying and summarily describing the important problems it refers to, and where possible by proposing solutions to them.

FORCE STRUCTURE

The relatively fixed ARF structure of 144 units has evolved as a result of a variety of influences, many of which are not directly related to military requirements. As a consequence, ARF units vary considerably in their potential wartime utility. The principal value of the least capable of these units is as a repository of skilled people from which to reconstitute effective force elements when new equipment becomes available. Lacking a credible wartime capability, such ARF "transition units" are a cost rather than a saving in the total force context. If it is necessary to perpetuate the full 144 unit force, transition units will continue to exist in significant numbers unless the active force makes first-line equipment available to the ARF either by further reductions of active inventories (possibly below militarily prudent levels) or by additional aircraft procurement. The first option may not be in consonance with the preferred total force structure and the latter may not be in consonance with budget realities.

Faced with an uneconomic,* yet a seemingly unalterable ARF 144 unit structure and an aging ARF aircraft inventory, Air Force planners have chosen to spread the newer aircraft available for transfer to the ARF over more squadrons than is the practice in the active forces. Thus, fully equipped squadrons of obsolescent aircraft are giving way to under-equipped squadrons of newer aircraft. In terms of wartime potential it makes little difference whether 96 aircraft are organized in peacetime as 6 squadrons of 16 UE or 12 squadrons of 8 UE, but the former beddown is less costly to maintain, and economy of operation is the ARF's primary virtue.

Force structure analysis was beyond the scope of our study but our partial analyses have led us to believe that a better option may be available. If the 144 unit structure cannot be changed, its costs may at least be reduced by abandoning the present policy of applying equal readiness criteria to all ARF units. We suggest that (a) higher priority ARF units be consolidated into more economically scaled units wherever possible, and that lower priority equipment be spread across the remaining units; (b) lower priority units be explicitly identified as such, and their readiness requirements revised downward to reduce flying activity; and (c) manpower authorizations for the maintenance and support activities of lower priority units be reduced.†

SUPPORT ELEMENTS

Roughly one-third to one-half of the manpower in ARF flying units that deploy in wartime to established bases is assigned to support elements that the flying units no longer need. These support elements

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*Besides additional overhead and basing costs, the present ARF beddown detracts from the potential advantages of new technology. For example, the present 18 UE squadron-sized beddown of ARF flying units would require about four times as many flight simulators for training its aircrews as is required by active units based as 72 UE wings.

†Our analysis of just the reduction of flying activity to AFR 60-1 minimums in those units that may be considered low priority indicates a potential five-year cost saving of more than $100 million, and if recruitment of replacements for reservists assigned to maintenance and support positions could be postponed until receipt of modern equipment is imminent, the five-year cost saving would be significantly greater.

are holdovers from an earlier organizational structure that was designed for self-supporting ARF units, deployed in wartime on austere airfields. The gaining commands now exclude this support from the flying units' mobility packages, using instead the specially tailored mobility support flights to augment the base support at the deployment bases. The justification for the other support elements has been changed to that of providing support augmentation in wartime to the overall Air Force. In peacetime, they are supposed to furnish support services to their parent units, in the same manner as comparable support units in the active forces.

We think these justifications could stand reevaluation. It is highly questionable that these large support forces constitute the most cost-effective way to provide peacetime support services that may be beyond the capability of the mobility support flights and the full-time civilian work forces that the flying units are authorized. To the extent that these support reservists are needed as wartime augmentation they are a bargain compared to active duty personnel, but we have seen no studies in which the wartime worth of the reserve support elements was balanced against their peacetime cost.

Whether or not there exists appropriate justification, the *collocation* of these elements with the flying units detracts from the flexibility, capability, and readiness of the primary combat elements, because it imposes upon each unit a significant recruiting and training burden.

Consider, as a first example, the combat support element. Combat support authorizations for USAFR flying units are tailored to the type of base upon which the unit is located: on Air Force bases the CS element may contain as few as 50 people, whereas a similarly configured flying unit may have more than 200 people in CS if the unit is located at a commercial airport. The CS element of an ANG unit, regardless of location, contains approximately 200 people. Overall, about 20,000 reservist positions are authorized in the combat support elements of deployable ARF units. Inasmuch as the CS elements cannot be justified by the small amount of ongoing support they provide to flight components in peacetime, nor (with the exception of those relatively few

units that do not deploy to existing Air Force bases after mobilization)* are they needed by the flying units in wartime, we conclude that these CS authorizations deserve close scrutiny. Any wartime potential value (as fillers) that may be credited to them should be weighed against their estimated $60 million or more annual drain on the Air Force budget.

A second example is afforded by the civil engineering flights of about 90 people found in most USAFR units and all ANG units. The wartime need for CEFs (8200 in the ANG and 2500 in the USAFR) is apparently justified separately by Hq USAF in support of overall USAF needs. In any case, the CEFs are collocated with the flying units for administrative convenience and not because they are required for peacetime support or for deployment in conjunction with the combat elements. In several of the units we visited, it was apparent that the CEFs competed with essential operations and maintenance elements for manpower resources from a limited local supply. Although we observed that the unit commanders generally attempt to afford realistic training for the CEF members, this is often of make-work variety and of questionable worth with regard to the development and maintenance of relevant skills. We conclude that the interests of the flying unit as well as the CEFs would be better served by centralizing the CEF authorization in a few locations where appropriate training can be provided and where they do not impose a burden on the primary combat elements.

CIVILIAN MANNING POLICIES

ANG and USAFR manning policies for civilians in peacetime support activities differ markedly. The USAFR uses regular civilians for base support, whereas the ANG uses Air Technicians--civilians who are required to be reservist members of the units. Since the Air Technician-reservists are paid in both roles it is possible that the combined pay will attract better qualified, career personnel and the ANG approach, therefore, may be preferable for manning *some* of the civilian support jobs, i.e., up to the number of reservists who are needed for assignments that involve deployment in time of war. Beyond that number, the

*For example, those with CONUS air defense missions.

USAFR approach seems better: For support tasks with post-mobilization requirements at the home station, two individuals--a civilian and a reservist--can be acquired under the USAFR manning policy for the cost of one Air Technician. Alternatively, in the absence of such a corresponding wartime support need, only the civilian worker need be funded.

GRADE STRUCTURE

The ARF grade structure closely resembles that of the active forces, implying that there is, or it is intended that there be, a similar career progression pattern for actives and reservists. But one of the most appealing aspects of the ARF is that it can recapture trained, experienced manpower from the actives, in effect capitalizing on a significant sunken investment that would otherwise be lost. We have demonstrated that, in view of training cost avoidance and higher retention rates, E-5 level prior-service personnel cost an ARF unit less overall than do nonprior-service personnel and afford the unit a more immediate productive resource as well.

Nevertheless, we have observed numerous instances wherein units have been compelled to recruit personnel without prior-service experience because the pay grade level available was insufficient to attract the more experienced individuals. Accordingly, we strongly urge that ARF grade authorizations be restructured to enable greater procurement and retention of personnel with prior-service.

Coupled with this, we have suggested reductions in overall manpower authorizations, as a suggested starting point trading 1.5 nonprior-service positions for each prior-service position added. We stress that this tradeoff ratio, based on our analyses and the results of opinion surveys directed at ARF maintenance officers, is tentative; only through experimentation can the Air Force firmly define an appropriate value.

CAPABILITY

To the extent that ARF units may differ from active units in their availability, readiness, and potential wartime capability, an area of

uncertainty exists that confounds straightforward force mix tradeoffs.* While it is obvious that costs can be reduced through transfer of units from the active forces to the ARF, these potential savings must be judged in the light of the possible diminution of total force capability that such transfers may impose: Are the cost savings worth the possible reduced capability?

There are several important factors that must be taken into account at the outset of any force mix deliberation. First, because the ARF is a part-time, augmenting force, missions that require high participation rates in peacetime are clearly inappropriate for the ARF. But even for missions whose training requirements can be met within the time limitations that are acceptable to part-time reservists, ARF units must be considered less available for the wide range of contingencies that confront the active forces. Considerable discretion must be exercised in mobilizing part or all of the ARF, and this fact alone must be viewed as a constraint on their availability for other than unambiguous threats to our national security. Furthermore, to the extent that ARF units cannot attain proficiency in the complete range of wartime missions for certain aircraft, the absence of total DOC capability must be weighed: Is it essential that all units be mission-ready in both primary and secondary DOC requirements?

Another factor--capability to perform their prescribed wartime tasks--derives from the inherent differences between active and ARF units: ARF units contain different kinds of people in terms of age, experience, and motivation; they operate under different conditions in many instances; and they work under different priorities than similarly equipped active units. Given these and other inherent differences, one might expect that their wartime performance would also differ. We have attempted to shed some light on this by addressing the following question: Given that the decision to mobilize has been taken and implemented, within the range of wartime missions for which ARF units are tasked, are there significant recognizable differences between similarly

*This is compounded by unwarranted skepticism of ARF capabilities on the part of some Air Force active duty officers.

equipped and similarly constituted active and ARF units that need to be taken into consideration by planners in structuring the total force mix?

Our approach was to compare active and ARF units with the same aircraft (A-7, RF-4C, and C-130) in terms of their measurable characteristics and performance across a wide range of diverse measures, including:

- Mobility equipment readiness
- UCMS scores
- ORI/MEI scores
- Pilot experience
- Crew readiness rates
- Abort rates
- OR rates
- Maintenance productivity
- Maintenance force experience levels
- Accident rates
- Base self-sufficiency rates.

Within each case study comparison we observed many numerical differences, some favoring the active unit and others favoring the ARF unit, but no pattern emerged that would indicate a superiority of one over the other with respect to their assigned tasks and missions. To the extent that these comparisons are representative, we conclude that there are no significant limitations inherent in ARF units other than those mentioned earlier, namely, constraints on availability in ambiguous threat situations, and built-in limitations stemming from reduced availability for training in peacetime because of the part-time nature of reservist participation. Against these inherent shortcomings, however, the force planners must consider the somewhat larger force structure that could be maintained for a given budget outlay by a *prudent* increase in the ARF share of the total force.

It is believed that the methodologies for measuring capability and for estimating costs that were developed as a part of this study

will facilitate the active/ARF force mix tradeoff studies that are needed to identify the preferred missions for the ARF.

The Air Force's reserve program was commended, in a DoD study of total force policy implementation, for the high state of readiness of its reserve units and for its achievements in integrating active and reserve forces.* On the basis of our studies we also concluded that the Air Force, in its reserve components, has developed a remarkably effective volunteer and part-time force, reflecting the Air Force's commitment to the total force policy. The personnel who man the reserve squadrons are skilled and dedicated, and given modern aircraft we believe they could produce an impressive wartime capability--often at significantly less cost than that required for full-time active forces. However, ARF units may have some deficiencies compared with similarly equipped active units in certain mission areas. A more comprehensive evaluation using the methodology described in this study is recommended to rank the suitability of the various kinds of Air Force missions and aircraft to the ARF. This would be an important contribution to the on-going deliberations over the appropriate mix of active and reserve units in the total force.

To the extent that additional force transfers to the ARF can be made (where the savings are believed to warrant the somewhat increased risk), and marginally cost-effective ARF units can be pruned and consolidated, and the various personnel and operational policy options discussed in the foregoing pages can be implemented, operating funds would be released that could be committed to higher priority programs; for example, to ARF modernization. Such a modernization program seems clearly to be the key to the future viability of the ARF as an economical and capable associate member of the total force.

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*The DoD study of *The Guard and Reserve in the Total Force* (September 1975) (Ref. 47) gave the Air Reserve Forces generally high marks and offered no recommendations for new program guidance.

Appendix

A COMPARISON OF THE COST OF SPECIFIED ACTIVE DUTY MILITARY PERSONNEL AND RESERVIST/AIR TECHNICIANS

In Sec. III of the main body of the report (pp. 23 to 27), a comparison is made of the annual cost of active duty military personnel and Air Technicians. This appendix presents supporting data and source references that formed the basis for that analysis.

The purpose of the comparison was to evaluate the validity of the often-expressed view that Air Technicians cost the DoD significantly more than active duty military personnel of comparable grade and experience. The rationale for that belief stems from the fact that a Technician is required to be a reservist member of his unit and as a consequence he receives both civil service and reservist pay and benefits. This is basically correct as far as it goes; however, it can be pointed out that active duty military personnel receive many non-pay benefits that are not available to Technicians and although both military and Technician personnel receive retirement benefits at government expense, only the Technician costs include any explicit funding for them. Also, active military personnel change assignments much more frequently than Technicians, which generates a PCS travel cost differential, and there are other differences with significant cost implications.

Obviously, to make a proper comparison between active duty military personnel and Air Technicians it is necessary to compare like grades and to include all of the costs they generate. For our analysis two sets of cost comparisons will be made: The first is between an active duty colonel (0-6) and a GS-14 Air Technician who also occupies a rated colonel position in the reserve unit. The second comparison is between an active technical sergeant (E-6) and the quite prevalent WB-10 (blue collar) Technician who is also a technical sergeant in the reserve unit.

Table 66 shows the official "standard pay rates" for these grades; however, the military figures are worldwide averages and, as noted

Table 66

STANDARD PAY RATES FOR SELECTED MILITARY AND AIR TECHNICIAN GRADES

(FY 1976)

Pay Component	O-6	E-6	GS-14	WB-10[a]
Basic pay	$26,492	$ 8,546	$31,837	$12,809
Incentive/special pay	2,027	128	--	--
Quarters allowance	1,870	1,107	--	--
Miscellaneous	2,772	2,037	--	--
Total	$33,161	$11,818	$31,837	$12,809

SOURCE: Ref. 48, Vol. I, Tables 20 and 24.

[a]Average for ARF bases (CONUS).

above, both military and civilian pay rates omit several important cost elements. In the sections that follow, a more complete and uniform tabulation of military and Air Technician costs will be developed so that a comparison of the resultant total costs of each personnel type will more nearly represent their true differences. By their nature, many of the non-pay cost elements can only be approximated so the reader should not infer that any high degree of precision resides in the cost figures. Nevertheless, we think the estimates are reasonable and certainly adequate to determine whether a *significant* cost difference exists between comparable active military and Technician personnel.

ACTIVE DUTY MILITARY PAY AND ALLOWANCES AND PCS

Table 67 presents a tabulation of the FY 1976 pay and allowances and PCS travel costs attributable to a rated O-6 active duty colonel and an E-6 technical sergeant. The standard military pay rates shown in Table 66 were broken down into their component elements with data provided in the 1976 USAF *Budget Justifications*[*] and appear in the "worldwide average" columns.

To arrive at pay and allowance estimates more appropriate to our comparisons (shown to the right of the worldwide average columns), the

[*]Reference 49, pp. 1-106.

Table 67

ACTIVE DUTY MILITARY ANNUAL PAY AND ALLOWANCES AND PCS

(FY 1976)

Pay Component	Colonel (O-6)		Technical Sergeant (E-6)		
				CONUS	
	Worldwide Average YOS=22	CONUS Rated YOS=22	Worldwide Average YOS=13	Nonfly Status YOS=13	Nonfly Status YOS=18
Pay and allowances					
Basic pay	$26,492	$26,492	$ 8,546	$ 8,546	$ 9,130
Incentive/special pay	2,027	2,308	128	--	--
Quarters allowance	1,870	3,272	1,107	1,901	1,901
Miscellaneous	(2,772)	(1,431)	(2,137)[a]	(1,518)	(1,557)
Subsistence	606	606	865	865	865
FICA	825	825	495	495	534
Reenlistment bonus	--	--	47	47	47
Proficiency pay	--	--	11	11	11
Clothing allowance	18	--	100	100	100
Separation	1,033	--	391	--	--
Overseas allowance	177	--	223	--	--
Other	113	--	6	--	--
Total pay and allowance	$33,161	$33,503	$11,918	$11,965	$12,588
PCS[b]		755			460
Grand total		$34,258			$13,048

[a]This is $100 higher than the figure in Table 66. Possibly the clothing maintenance allowance was disregarded in the earlier source.

[b]Reference 48, Vol. I, Table 27A.

overseas categories were omitted as well as certain prorations of overall personnel costs that are not representative of senior, career personnel, e.g., separation allowances and similar payments. The weighted average basic pay of the colonel represents about 22 to 23 years of service (YOS), which is suitable for our comparisons. However, the 13 YOS implied by the E-6 weighted average pay rate would not approximate the experience level and YOS of the E-6 reservist/Air Technician aircraft mechanic. Therefore, an 18 YOS rate was used instead. The higher incentive pay shown for the colonel is the average for *rated* officers. The quarters allowances are the rates for military personnel *with dependents* for the assumed grades. The PCS travel factors reflect

the frequent assignment changes of active military personnel. The figures for reenlistment bonuses and proficiency pay are those given in the *Budget Justifications* for the E-6 level. Other indirect costs are incurred by active duty military personnel. These will be examined below in the subsection on total annual costs.

AIR TECHNICIAN ANNUAL PAY AND OTHER EXPENSES

Table 68 displays the annual costs incurred by GS-14 and WB-10 civil service employees. Wage Board basic pay rates are set according to the local pay scales of blue collar workers and they vary from place to place. The figure shown for the WB-10 is an average value for CONUS reserve units. The estimates for the other Air Technician cost elements are based on information in the ANG and USAFR *Budget Justifications*.*

Table 68

AIR TECHNICIAN ANNUAL PAY AND OTHER EXPENSES

(FY 1976)

Pay Component	GS-14	WB-10
Basic pay	$31,837	$12,809[a]
Other compensation	180	180
Retirement[b]	2,229	896
Other benefits	595	595
Travel and per diem	295	295
Total	$35,136	$14,775

[a]CONUS average for ARF units.

[b]Government share.

The estimate for the "other compensation" category is an overall weighted average of ANG and USAFR overtime and holiday pay, the Sunday and night pay differential, premium pay, and "other." The "other benefits" figure also is a weighted average of the cost of benefits shown in *Budget Justifications* for ANG and USAFR civilians, excluding the

*Reference 8, pp. 183-205, 209-227.

government retirement contributions, which are shown separately in Table 68. The benefits include life insurance, health benefits, workmen's compensation, unemployment insurance, etc. The sum of these latter benefits is small and no effort was made to determine the differential by rank.

The civil service retirement program is funded by both the employee and the government, each contributing 7 percent of the basic pay rate. "Travel and per diem" covers additional expenses incurred by Air Technicians to attend schools and conferences as required in the performance of their duties.* DoD regulations spell out which hat (Air Technician or reservist) they will wear and to which paycheck they are entitled for various ARF functions--they cannot receive both for the same period.† (Reservist pay is added to their Air Technician pay in the next two tables, below.)

TOTAL ANNUAL COST COMPARISONS

Table 69 compares the *total* annual cost of a rated active duty colonel and a GS-14 Air Technician who is also a rated colonel in his reserve unit. Table 70 provides a similar comparison for an active duty E-6 and a reserve/Air Technician of comparable grade. It will be noted that a number of indirect costs have been added to the military personnel categories (including an imputed annual contribution needed to fund their future retirement benefits) and that the reservist pay and other expenses have been added to the previously shown Technician costs. The derivation and limitations of the new cost elements will be discussed below.

Reservist Pay and Other Expenses

The basic pay and incentive pay shown for the reservists represents 100 drills and active duty man-days for the rated reserve colonel and

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*This cost element is based upon the ANG data, since the USAFR data include regular civilians who rarely travel at government expense.

†Except for military leave, commonly given to all federal and state government employees (and to employees of many private concerns) who are reservists, to permit attendance at the annual two-week active duty training tours.

Table 69

COST COMPARISON: ACTIVE DUTY (RATED) COLONEL (O-6) AND RESERVIST (O-6)/AIR TECHNICIAN (GS-14)

Pay Component	Active Duty (Rated O-6)	Reservist/ Air Technician (Rated O-6)	Reservist/ Air Technician (GS-14)
Direct			
Basic pay	$26,492	$ 7,360	$31,837
Incentive pay	2,308	640	--
FICA	825	468	
Other allowances and benefits	3,878	--	775
PCS	755	--	
Subtotal	$34,258	$ 8,468	$32,612
Indirect			
Variable BOS/medical personnel costs	$ 2,500[a]	$ 490[b]	--
Other personnel costs	4,748[a]	504[b]	295
Tax advantage	2,140[c]	--	--
Retirement	6,755[c]	795[c]	2,229
Total	$50,401	$10,257	$35,136
Grand total (rounded)	$50,000	$45,000	

[a]Commissary/BX, $139; medical, $1,119; replacement training, $3,490 ($105,700 x 1/30 turnover rate).

[b]Special training travel, $104; annual training, $400.

[c]Imputed.

63 for the E-6 technical sergeant. These man-day figures approximate the average participation rates given in the *Budget Justifications*.[49] Each drill and man-day is worth 1/30 of the monthly active duty pay for the comparable rank. The annual travel and training estimates were derived from the information in Ref. 49. The government contribution to Social Security amounts to 5.85 percent of the first $14,100 of earnings.* Although the pay for the Air Technicians exceeds this minimum, civil service personnel are excluded from FICA. Therefore their reservist pay is subject to this added cost. The estimate for variable

*The level of cutoff increases regularly each year so that the amount shown in the table now understates the government Social Security contribution by a small amount.

Table 70

COST COMPARISON: ACTIVE DUTY TECHNICAL SERGEANT (E-6) AND RESERVIST (E-6)/AIR TECHNICIAN (WB-10)

Pay Component	Active Duty (E-6)[a]	Reservist/ Air Technician	
		(E-6)[a]	(WB-10)
Direct			
Basic pay	$ 9,130	$1,598	$12,809
FICA	534	93	--
Other allowances and benefits	2,924	--	775
PCS	460	--	
Subtotal	13,048	1,691	13,584
Indirect			
Variable BOS/medical personnel costs	2,500[b]	490[c]	--
Other personnel costs	1,858[b]	95[c]	295
Tax advantage	551[d]	--	--
Retirement	3,150[d]	183[d]	896
Total	$21,107	$2,459	$14,775
Grand total (rounded)	$21,000	$17,000	

[a]With 18 years of service.

[b]Commissary/BX, $139; medical, $1,119; replacement training, $600 ($12,000 x 1/20 turnover rate).

[c]Special training travel, $12; annual training, $83.

[d]Imputed.

BOS covers the cost of Air Technician (or regular civilian) BOS personnel at the rate of 3.4 percent of the number of reservist personnel supported. This factor was found by a regression analysis of ANG bases. The imputed retirement contribution will be discussed below.

Additional Personnel Costs of Active Duty Military Personnel

Variable BOS/Medical Personnel Costs. Base operating support personnel and medical personnel provide wide-ranging services to active duty personnel, including personnel services, finance, legal assistance, base housing, etc. Factors totaling approximately 20 percent are presently used by the Air Force to estimate variable BOS/medical

personnel costs as a function of base population.* Therefore, this percentage was used to estimate the average variable support generated by active duty military personnel.

Other Personnel Costs. As noted in the footnote to the tables, this category covers such expenditures as commissary, base exchange, and medical benefits, estimated in Ref. 50, and replacement training. The latter estimate is based on the cost of replacement training and the low careerist turnover rate implied by the indicated years of service at retirement.†

Tax Advantage. The federal income tax is levied only on the basic and incentive pay of military personnel; quarters and subsistence, whether in cash or in kind, go untaxed. Technicians, of course, are taxed on that portion of their pay that goes into food and housing. Therefore, in comparisons of the total cost of military and civilian personnel, it is customary to include an estimate of the value of this so-called military tax advantage.(50) The failure to collect tax on quarters and subsistence allowances can be considered a cost to the government in the sense that it is money that that the government will not get back, and including an estimate of the value of this benefit helps to put military and Technician pay on a more equivalent basis.

Implied Retirement Contributions of Military Personnel. The retirement contributions for Technicians make up a significant element in their annual costs, whereas this element is missing from the corresponding military costs. Unlike the civil service pension system in which both the government and the employee contribute 7 percent of the base salary to build up a retirement fund, the military pensions are paid out of the current DoD (not USAF) budget. Thus, the budgeted 1976 military retirement expenditures represent payments to personnel who have retired rather than the cost of annuity fund contributions for those presently serving in the armed forces. To make our comparisons more consistent, the figures shown in Tables 69 and 70 contain approximations of what the annual contributions of O-6 and E-6 military personnel would have to be to fund the military pension system in a manner comparable to that of the civil service plan. They reflect the

*Reference 48, Vol. II, Sec. 2, pp. 3-4.

†Reference 48, Vol. I, Tables 29 and 51A.

same assumptions that underlie the civil service contributions, namely, a 5 percent real* interest rate on the annuity fund and no real increase in pay scales over time. Although the subject is controversial, there is evidence that a much larger contribution rate is needed to adequately fund the military and civil service retirement plans.† Nevertheless, for the purposes of this relative comparison, consistency in approach is the important consideration. We calculated the necessary retirement contributions assuming a lower interest rate and a factor for real pay growth and found that it simply increased the retirement estimates for both the military personnel and the Technicians; the total cost rankings remained unchanged.

The approach used to determine the implicit contributions for the active duty and reserve military personnel involves (1) an actuarial estimate of the total retirement annuity payments discounted annually at 5 percent to the time of retirement, and (2) calculations of the implicit annual contributions as a constant percentage of active duty base pay‡ needed to fund the annuity at 5 percent compound interest over the individual's period of service. Since a fairly large proportion of military personnel will leave the service before they qualify for retirement benefits, it might seem appropriate to average over the entire manpower base the imputed total annual retirement contribution required for those military careerists who *will* retire. However, this approach would ignore the characteristics of the military personnel included in our comparison. The military ranks that correspond to the grades and experience levels of most Air Technicians are held by

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*The nominal interest rate, less inflation. Since the military and civil service retirement plans contain cost of living escalation provisions (and no longer have the "1 percent kicker"), use of real interest and pay growth factors simplify the calculations.

†For example, a communication from the Third Quadrennial Review of Military Compensation, quoted in Ref. 51, suggested the use of a 3.5 percent interest rate to fully fund the military and civil service pension systems.

‡Note that *active duty* annual pay rates were used as the basis for the contribution percentages for both active duty personnel and reservists; reservist pay bears no direct relationship to the point system that determines the size of reservist pensions.

careerists who will eventually quality for retirement.* Therefore, since they generate funding requirements for retirement benefits, it is manifest that the total annual cost attributed to them should reflect the full costs of financing their retirement. And amassing the imputed individual military annuity funds as a constant percentage of basic pay over their military careers also is consistent with the civil service method of financing the retirement funds of Air Technicians.

The amount of a military retiree's annual pension is equal to the annual active duty basic pay at the highest attained rank multiplied by the percentage equal to 2-1/2 percent for each active duty year of service up to a maximum of 75 percent.† Reserves "constructive" years of service toward retirement require a minimum of 50 points acquired by attending drills and other training activities,‡ and these points are then divided by 360 to convert them to an annual basis. Assuming 75 points a year as a reasonable approximation of reservist point accumulation, each reserve year increases the annual pension only 21 percent as much as a year of active duty. This relationship establishes the relative percent-of-pay contributions for the active duty and reserve years of reservist retirees who have served on active duty as well as with an ARF unit.**

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*At five YOS two-thirds of the officers and only 40 percent of the airmen are expected to qualify for retirement. However, by 10 YOS, fully 96 percent of the officers and 77 percent of the airmen will remain in the service until retirement, and beyond 16 years the rate increases to nearly unity for both officers and airmen.

†For example, 25 YOS times 2-1/2 percent equals 62-1/2 percent. Therefore, the annual pension for a 25 year veteran is equal to 62-1/2 percent of his highest attained annual pay rate.

‡Regardless of actual attendance, a maximum of 60 points is allowed for participation in inactive duty training drills. Fifteen points are awarded just for membership in a reserve unit. Additional points may be earned by participating in exercises, conferences, training, etc., while on temporary active duty.

**That is, in our reservist E-6 example, the imputed annual retirement contributions were calculated as 9.6 percent of active duty basic pay during his 3 years on active duty and 2 percent for his 27 years in the ARF.

For retirees from the active military forces, the pension begins immediately upon retirement, once the required 20 year minimum has been reached. Reservists, however, must wait until age 60. This interval has a double effect on the required retirement annuity fund: The total pay-out period for the reservist is much less; and the retirement "fund" increases at compound interest from the time of retirement until the pension begins at age 60.

Tables 71 and 72 summarize the retirement assumptions and calculations.* A "normal" career pattern of promotions is assumed in determining total career military pay, a basic ingredient of the imputed retirement contribution calculation. Career length tends to be longer in reserve units, particularly for Technicians. Therefore, the following typical career lengths were selected:

Years of Service

Grade	Active	Reservist
0-6	30[a]	35 (4 on active duty)
E-6	20	30 (3 on active duty)

[a]A large proportion of active duty 0-6s retire at 26-27 YOS. Our assumption of 30 YOS is conservative, resulting in a lower imputed retirement contribution.

CONCLUSION

The purpose of this comparison of the annual costs of active duty military personnel and Air Technicians of comparable grade and experience was to evaluate the validity of the contention that Air Technicians are significantly more expensive than their active duty military counterparts. The estimates that appeared above in Tables 69 and 70 suggest the opposite--that Air Technicians actually are less expensive than comparable active duty military personnel; however, the

*The JOSS program used for these calculations is available from Rand upon request. JOSS is the trademark and service mark of The Rand Corporation for its computer program and services using that program.

Table 71

RETIREMENT ASSUMPTIONS AND CALCULATIONS: ACTIVE DUTY AND ARF OFFICER, NORMAL CAREER PROFILE

Active Officer--30 YOS, Retires as 0-6

Age: Enter svc 22; retire 52; begin pension 52(0-yr delay); death 74.
Career profile--year promoted to shown rank:

Rank:	0-1	0-2	0-3	0-4	0-5	0-6
AD	1	3	6	11	17	23
ARF	0	0	0	0	0	0

Retiremt pts: 30 AD yrs x 360 pts + 0 ARF yrs x 0 pts = 10800 tot pts.
Constructive yrs for retirement = total points / 360 = 30.0 constr yrs.
Constr yrs x 2.5% = 75.0%. This pct x highest ann. wage ($29113) determines ann. pension ($21835) x 22 yrs = $480368, total pension.
With 5.0% real int. rate, req'd fund at beginning of pension = $287413.
Pension fund growth between retirement and beginning of pension = $ 0.
Therefore, the required annuity fund at time of retirement = $287413.
Imputed ann. retire contrib (% of AD basic pay rate) = AD 25.5%; ARF .0%.
Pay rates assume annual real pay growth of .0%.
Total contributions at retirement (incl. 5.0% ann. int.) = $287413.
a) NOTE: Interest has one-year lag. Interest for 30th year of service is included in subsequent annuity fund computations.

ARF Officer--35 YOS (4 on AD), Retires as 0-6

Age: Enter svc 22; retire 57; begin pension 60(3-yr delay); death 75.
Career profile--year promoted to shown rank:

Rank:	0-1	0-2	0-3	0-4	0-5	0-6
AD	1	3	0	0	0	0
ARF	0	0	6	12	19	26

Retiremt pts: 4 AD yrs x 360 pts + 31 ARF yrs x 75 pts = 3765 tot pts.
Constructive yrs for retirement = total points / 360 = 10.5 constr yrs.
Constr yrs x 2.5% = 26.1%. This pct x highest ann. wage ($29113) determines ann. pension ($ 7612) x 15 yrs = $114178, total pension.
With 5.0% real int. rate, req'd fund at beginning of pension = $ 79009.
Pension fund growth between retirement and beginning of pension = $ 10758.
Therefore, the required annuity fund at time of retirement = $ 68251.
Imputed ann. retire contrib (% of AD basic pay rate) = AD14.4%; ARF 3.0%.
Pay rates assume annual real pay growth of .0%.
Total contributions at retirement (incl. 5.0% ann. int.) = $ 68251.
a) NOTE: Interest has one-year lag. Interest for 35th year of service is included in subsequent annuity fund computations.

Table 72

RETIREMENT ASSUMPTIONS AND CALCULATIONS: ACTIVE DUTY AND ARF AIRMAN, NORMAL CAREER PROFILE

Active Airman--20 YOS, Retires as E-7

Age: Enter svc 19; retire 39; begin pension 39(0-yr delay); death 71.
Career profile--year promoted to shown rank:

Rank:	E-1	E-2	E-3	E-4	E-5	E-6	E-7
AD	1	1	2	4	6	11	17
ARF	0	0	0	0	0	0	0

Retiremt pts: 20 AD yrs x 360 pts + 0 ARF yrs x 0 pts = 7200 tot pts.
Constructive yrs for retirement = total points / 360 = 20.0 constr yrs.
Constr yrs x 2.5% = 50.0%. This pct x highest ann. wage ($10404)
determines ann. pension ($ 5202) x 32 yrs = $166464, total pension.
With 5.0% real int. rate, req'd fund at beginning of pension = $ 82206.
Pension fund growth between retirement and beginning of pension = $ 0.
Therefore, the required annuity fund at time of retirement = $ 82206.
Imputed ann. retire contrib (% of AD basic pay rate) = AD34.5%; ARF .0%.
Pay rates assume annual real pay growth of .0%.
Total contributions at retirement (incl. 5.0% ann. int.) = $ 82206.
a) NOTE: Interest has one-year lag. Interest for 20th year of service is included in subsequent annuity fund computations.

ARF Airman--30 YOS (3 on AD), Retires as E-7

Age: Enter svc 19; retire 49; begin pension 60(11-yr delay); death 73.
Career profile--year promoted to shown rank:

Rank:	E-1	E-2	E-3	E-4	E-5	E-6	E-7
AD	1	1	2	0	0	0	0
ARF	0	0	0	4	7	13	19

Retiremt pts: 3 AD yrs x 360 pts + 27 ARF yrs x 75 pts = 3105 tot pts.
Constructive yrs for retirement = total points / 360 = 8.6 constr yrs.
Constr yrs x 2.5% = 21.6%. This pct x highest ann. wage ($12647)
determines ann. pension ($ 2727) x 13 yrs = $ 35451, total pension.
With 5.0% real int. rate, req'd fund at beginning of pension = $ 25616.
Pension fund growth between retirement and beginning of pension = $ 10639.
Therefore, the required annuity fund at time of retirement = $ 14977.
Imputed ann. retire contrib (% of AD basic pay rate) = AD 9.6%; ARF 2.0%.
Pay rates assume annual real pay growth of .0%.
Total contributions at retirement (incl. 5.0% ann. int.) = $ 14977.
a) NOTE: Interest has one-year lag. Interest for 30th year of service is included in subsequent annuity fund computations.

differences are not great and, given the conceptual difficulties in structuring the comparison and the ability to only approximate some of the cost inputs, that conclusion can only be regarded as tentative. It does seem safe to conclude, however, that the view that Air Technicians cost significantly more than active duty military personnel of similar grade and capability is unwarranted, when total costs are considered.

As the cost comparisons discussed in this appendix include a number of support activities that would not be classified as "compensation" by military personnel, our costs are not directly comparable with those developed as a part of the Third Quadrennial Review of Military Compensation. We anticipate that some of the cost factors of that review could be useful in refining our estimates, but we judge that their impact on our overall comparisons between active duty and Technician personnel costs, in relative terms, would be minimal.

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