AD NUMBER

ADB165868

NEW LIMITATION CHANGE

TO

Approved for public release, distribution unlimited

FROM

Distribution authorized to DoD only; Administrative/Operational Use; 7 Aug 92. Other requests shall be referred to National Defense Univ., Attn: NDU-LD-SCH, Washington, DC 20319-6000.

AUTHORITY

DTIC Form 55, Control No. 0200020, dtd August 24, 2000.

1991
Executive Research Project
G4c

Strategic Airlift Support for U.S. Forces Deployment to Operation Desert Shield

Lieutenant Colonel
William R. Tefteller
U.S. Air Force Reserves

Faculty Research Advisor
Lieutenant Colonel David M. Wells, USMC

The Industrial College of the Armed Forces
National Defense University
Fort McNair, Washington, D.C. 20319-6000

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS Administrative or Operational Use 7 AUG 1992
2a. SECURITY CLASSIFICATION AUTHORITY N/A	3. DISTRIBUTION / AVAILABILITY OF REPORT Distribution limited to Department of Defense. All other requests should be forwarded through the National Defense University, ATTN: NDU-LD-SCH, Washington, D.C. 20319-6000. Contractor's requests must be signed by their DoD contract monitor to verify "need-to-know."
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE N/A	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) NDU-ICAF-91-G4c	5. MONITORING ORGANIZATION REPORT NUMBER(S) N/A
6a. NAME OF PERFORMING ORGANIZATION Industrial College of the Armed Forces 6b. OFFICE SYMBOL (If applicable) ICAF-AR	7a. NAME OF MONITORING ORGANIZATION National Defense University
6c. ADDRESS (City, State, and ZIP Code) Fort McNair Washington, D.C. 20319-6000	7b. ADDRESS (City, State, and ZIP Code) NDU-LD-SCH Ft. McNair Washington, D.C. 20319-6000
8a. NAME OF FUNDING / SPONSORING ORGANIZATION N/A 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N/A
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
Strategic Airlift Support for U.S. Forces Deployment to Operation Desert Shield

12. PERSONAL AUTHOR(S)
William R. Tefteller

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Research	FROM Aug 90 TO Apr 91	1991 April	90

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

See Attached

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Susan Lemke or Tina Lavato	22b. TELEPHONE (Include Area Code) (202) 287-9458 22c. OFFICE SYMBOL NDU-LD-SCH

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted. All other editions are obsolete.

Abstract

The logistics accomplishments of the strategic airlift support for Operation DESERT SHIELD set historical records. The launch from a standing start to full mobilization of the military airlift fleet was the most rapid ever conducted by the Military Airlift Command (MAC). Except for a brief lull during the first week in November 1990, the MAC team delivered the equivalent of the Berlin Airlift every five weeks.

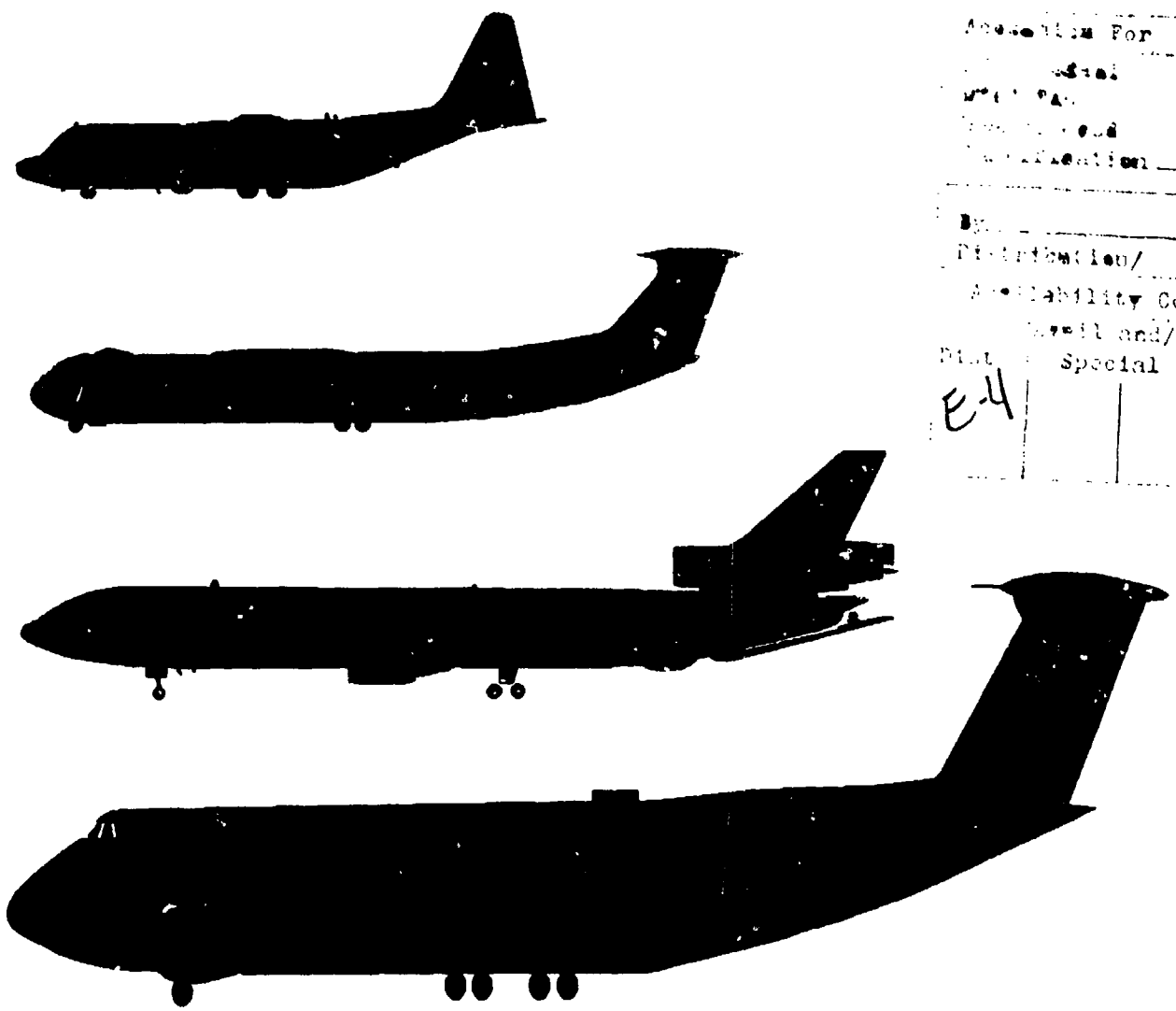
The official activation of the Civil Reserve Air Fleet (CRAF) was another historical first. The wide-body jumbo jets of the commercial air carriers were well suited to move massive amounts of cargo and huge numbers of combat troops in minimum time. In addition to the first use of the CRAF, the first large scale mobilization of the Selected and Ready Reserve forces since World War II brought over one fourth million citizen soldiers, airmen, sailors, Marines, and Coast Guard into the active service of our nation.

The airlift effort was so intense over such an extended period of time that some limiting factors soon became apparent. Enroute support facilities overflowed with deployed aircrews and support personnel. The peacetime C-5 aircrew ratio of three crews per airplane could not stay up with the high rate of daily flying time logged by the airframes. MAC was forced to extend almost every aircrew duty limitation to stretch those resources.

There were relatively few problems with CRAF participation in the airlift operation. The biggest complaint was the absence of chemical protective suits for the aircrews flying to the Gulf region during Iraqi Scud missile attacks. However, the first large scale activation of the Ready Reserves came as an unexpected shock for many people. This first major test of the Total Force concept validated the outstanding professionalism of the Air Force Reserves and the Air National Guard.

In the aftermath of DESERT SHIELD and the subsequent redeployment, the "lessons learned" process needs to begin immediately. The objective is fine-tuning an already magnificent airlift team which clearly demonstrated its worldwide strategic lift capability.

Strategic Airlift Support for U.S. Forces Deployment to Operation DESERT SHIELD



DISCLAIMER - ABSTAINER

Abstract

The logistics accomplishments of the strategic airlift support for Operation DESERT SHIELD set historical records. The launch from a standing start to full mobilization of the military airlift fleet was the most rapid ever conducted by the Military Airlift Command (MAC). Except for a brief lull during the first week in November 1990, the MAC team delivered the equivalent of the Berlin Airlift every five weeks.

The official activation of the Civil Reserve Air Fleet (CRAF) was another historical first. The wide-body jumbo jets of the commercial air carriers were well suited to move massive amounts of cargo and huge numbers of combat troops in minimum time. In addition to the first use of the CRAF, the first large scale mobilization of the Selected and Ready Reserve forces since World War II brought over one fourth million citizen soldiers, airmen, sailors, Marines, and Coast Guard into the active service of our nation.

The airlift effort was so intense over such an extended period of time that some limiting factors soon became apparent. Enroute support facilities overflowed with deployed aircrews and support personnel. The peacetime C-5 aircrew ratio of three crews per airplane could not stay up with the high rate of daily flying time logged by the airframes. MAC was forced to extend almost every aircrew duty limitation to stretch those resources.

There were relatively few problems with CRAF participation in the airlift operation. The biggest complaint was the absence of chemical protective suits for the aircrews flying to the Gulf region during Iraqi Scud missile attacks. However, the first large scale activation of the Ready Reserves came as an unexpected shock for many people. This first major test of the Total Force concept validated the outstanding professionalism of the Air Force Reserves and the Air National Guard.

In the aftermath of DESERT SHIELD and the subsequent redeployment, the "lessons learned" process needs to begin immediately The objective is fine-tuning an already magnificent airlift team which clearly demonstrated its worldwide strategic lift capability.

Table of Contents

"Never before in history has any nation airlifted as many tons over as many miles. At the height of our initial surge, more than 124 strategic airlifters were landing in the desert each day...that's one airplane every 11 minutes."

....General Hansford T. Johnson

General Johnson - the Commander in Chief of both the U.S. Transportation Command and the Military Airlift Command - was directly responsible for the monumental airlift and sealift supply line extending 8,000 air nautical miles to the Persian Gulf region. He and other senior military officials have been proudly reporting the historical airlift accomplishments of Operation DESERT SHIELD, ever since the first C-141 landed in Saudi Arabia with lead elements of the 82nd Airborne Division Ready Brigade on 7 August 1990.

The magnitude of the airlift was huge - but so were the problems. As General Johnson noted in an earlier speech, "In many respects, particularly from a transportation perspective, DESERT SHIELD was a worst case scenario. Our warning time was extremely limited, we had virtually no forces in place, and we had to move our forces a great distance."

The hot blowing sand and the barren desert wasteland stunned the leading elements of American forces who stepped out of MAC airplanes onto Saudi Arabian soil. The only evidence of habitation was large areas of poured concrete at the shipping docks and numerous aircraft runways scattered around the desert. Nothing else, just flat concrete. Everything else had to be airlifted or sealifted into the region. And the first priority for shipment was combat arms. Human needs had to wait almost two months before even the minimum comfort levels could be met.

Brigadier General James L. Cole, Jr. also remarked on the magnitude of the initial surge deployment. He is the Assistant Deputy Chief of Staff for Operations at Headquarters Military Airlift Command and one of the prime movers in the DESERT SHIELD airlift operation. He recalled that, "the Aerial Port of Debarkation (APOD) was strictly bare base and totally devoid of supporting infrastructure. Everything we needed to set up and operate the airfreight pipeline had to be airlifted. All our people needs had to be satisfied by airlift during the first two months because of the enroute transient time of sealift and because the first shipments contained mostly combat arms." He also admitted his amazement at the magnitude of the airlift tasking: "The sharp ramp-up necessitated pulling out all the stops. Everyone gave incredible effort to the airlift surge."

With the tremendous imbalance of forces between Iraq and the United States and its allies, many experts say that we were lucky in those first few weeks after the invasion. In Air Force Magazine, Stewart M. Powell wrote of the urgent and massive airlift operation with C-141, C-5, KC-10, and commercial aircraft. He called it an "...aluminum bridge which carried 72,000 tons of cargo and 91,000 people in first 30 days. This [airlift effort] was vital to U.S. plans for bolstering a thin line of American defenders in the critical days before more than 130 ship deliveries boosted this nation's stockpiles to more than 7.5 million tons of materiel, enough to sustain the expanding US force for more than thirty days of combat."

And as Brigadier General Cole indicated, we pulled out all the stops. For the first time since its conception 38 years ago, the activated Civil Reserve Air Fleet got to proudly show its stuff. Using their fleet of wide-body jumbo jets, the commercial air carriers moved one fourth of all the cargo and 64 percent of the troops from the United States to the Persian Gulf region at 0.84 MACH[1]. In addition, the National Command Authority activated major elements of the Reserves and National Guard to provide additional firepower and combat support. By 29 January 1991, over 200,000 National Guard and Reserve personnel had reported for active duty service in support of DESERT SHIELD and DESERT STORM.

[1] Approximately 580 miles per hour.

While specific data is still classified, sufficient information is available to begin a review and analysis of this historical event. Indeed, DESERT SHIELD/DESERT STORM appears to be the most thoroughly documented affair in the history of armed conflict. Satellite communications and instantaneous, real-time television coverage changed warfare forever. The high-tech war included dramatic air power video segments of powerful munitions knocking on front doors and dropping down chimneys. And as always, the support and logistics efforts took a back seat to the glamour of combat arms.

This report gathered first-available operational data to begin telling the airlift story in Operation DESERT SHIELD. Command historians and public affairs officials provided the bulk of the information and every person contacted was eager to tell of the magnificent accomplishments of the MAC airlift team. Key airlift senior officers and their staffs provided additional command-level perspective during personal interviews. The Air Staff at the Pentagon provided important information about National Guard and Reserve participation in DESERT SHIELD and about airlift aircraft manning. The report looks at both the airlift airplanes and the aircrews. In addition, the paper also examines the historical first use of the Civil Reserve Air Fleet and the first large scale activation of the National Guard and Reserve forces since World War II.

Finally, the report examines some issues and problems that attracted attention during the airlift operation. The intensity of the mission flow and the overall magnitude of the effort tested the limits of our airlift capability. While the DESERT SHIELD airlift deployment was a clear and overwhelming success, some problems did occur.

However, the most important story in the whole operation is about the incredible effort expended by the people on the MAC airlift team. The active duty personnel, the Air National Guard, the Air Force Reserves and the Civil Reserve Air Fleet carriers combined their efforts to make airlift history. They leaned forward, pushed their machines to the limits, and moved almost 4 billion ton-miles of war fighting capability in 197 days. As of 20 February 1991, this historical achievement measured over 456,000 troops and 478,000 tons of cargo on 13,600 missions at an average distance of 8,000 air nautical miles.

02 August 1990	**Iraq invaded Kuwait; President issued Executive Order 12722, declared national emergency.**
07 August 1990	**C-DAY; first C-141 landed in Saudi Arabia with elements of the 82nd Airborne Division Ready Brigade; first commercial airlift flight departs Pope AFB, North Carolina.**
08 August 1990	**First tactical air forces (F-15s) arrive.**
17 August 1990	**Civil Reserve Air Fleet Stage I activated.**
22 August 1990	**President implemented 200 K call-up of Selected Reserves.**
26 August 1990	**U.S. Central Command moved their Headquarters to their Area of Responsibility (AOR) in Saudi Arabia.**
01 September 1990	**Military services commenced stop-loss personnel actions.**
05 November 1990	**Defense Appropriation Act authorized increased call-up of Selected Reservists for up to 180 days.**
08 November 1990	**President ordered additional military forces to build offensive capability.**
14 November 1990	**Secretary of Defense increased Reserve call-up authority to 125,000.**

29 November 1990	United Nations Security Council passed Resolution 678 authorizing U.N. members "to use all necessary means" to bring about Iraqi withdrawal after 15 January 1991 deadline.
01 December 1990	Secretary of Defense increased call-up authority to 188,000 Reservists.
12 January 1991	U.S. Congress passed joint resolution in support of United Nations Resolutions.
16 January 1991	Operation Desert Storm commenced.
17 January 1991	Civil Reserve Air Fleet Stage II implemented.
18 January 1991	President issues Executive Order to recall individuals and units of the Ready Reserve to active duty for not more than two years.
19 January 1991	Secretary of Defense implements 18 January 1991 Executive Order with Memorandum to the Services authorizing recall of up to 316,000 Ready Reserves to active duty for not more than 12 months.
23 February 1991	G-day: Commencement of the ground war.
27 February 1991	Cease Fire announced by President Bush.
7 March 1991	Redeployment commenced.

According to Mr David Garner at the Logistics Management Institute (LMI), the following U.S. military forces deployed to the Persian Gulf region:

U.S. ARMY:

Headquarters, 3rd U.S. Army	Fort McPherson, Georgia
Headquarters, XVIII Airborne	Fort Bragg, North Carolina
82nd Airborne Division	Fort Bragg, North Carolina
1st Corps Support Command	Fort Bragg, North Carolina
24th Infantry Division (Mechanized)	Fort Stewart, Georgia
197th Infantry Brigade (Mechanized)	Fort Benning, Georgia
101st Airborne Division (Air Assault)	Fort Campbell, Kentucky
101st Aviation Brigade	Fort Campbell, Kentucky
III Corps Artillery	Fort Sill, Oklahoma
1st Calvary Division	Fort Hood, Texas
2nd Armored Division	Fort Hood, Texas
13th Corps Support Command	Fort Hood, Texas
3rd Armored Calvary Regiment	Fort Bliss, Texas
11th Air Defense Artillery Brigade	Fort Bliss, Texas
1st Special Forces Command	Fort Bragg, North Carolina
5th Special Forces Group	Fort Campbell, Kentucky
12th Combat Aviation Brigade	Federal Republic of Germany
3rd Armored Division (Aviation)	Federal Republic of Germany
7th Medical Command	Federal Republic of Germany

U.S. Forces Deployed to Saudi Arabia

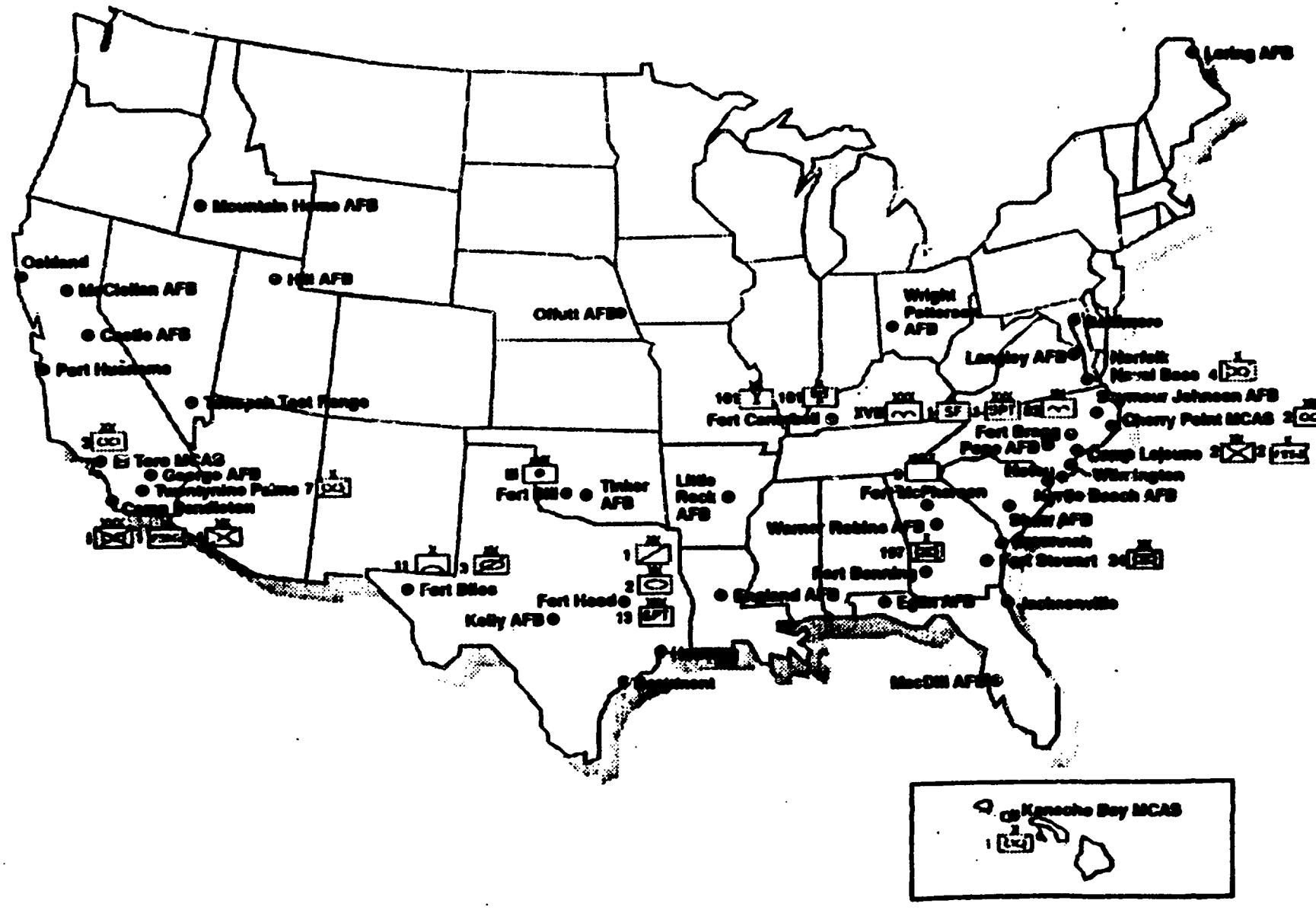
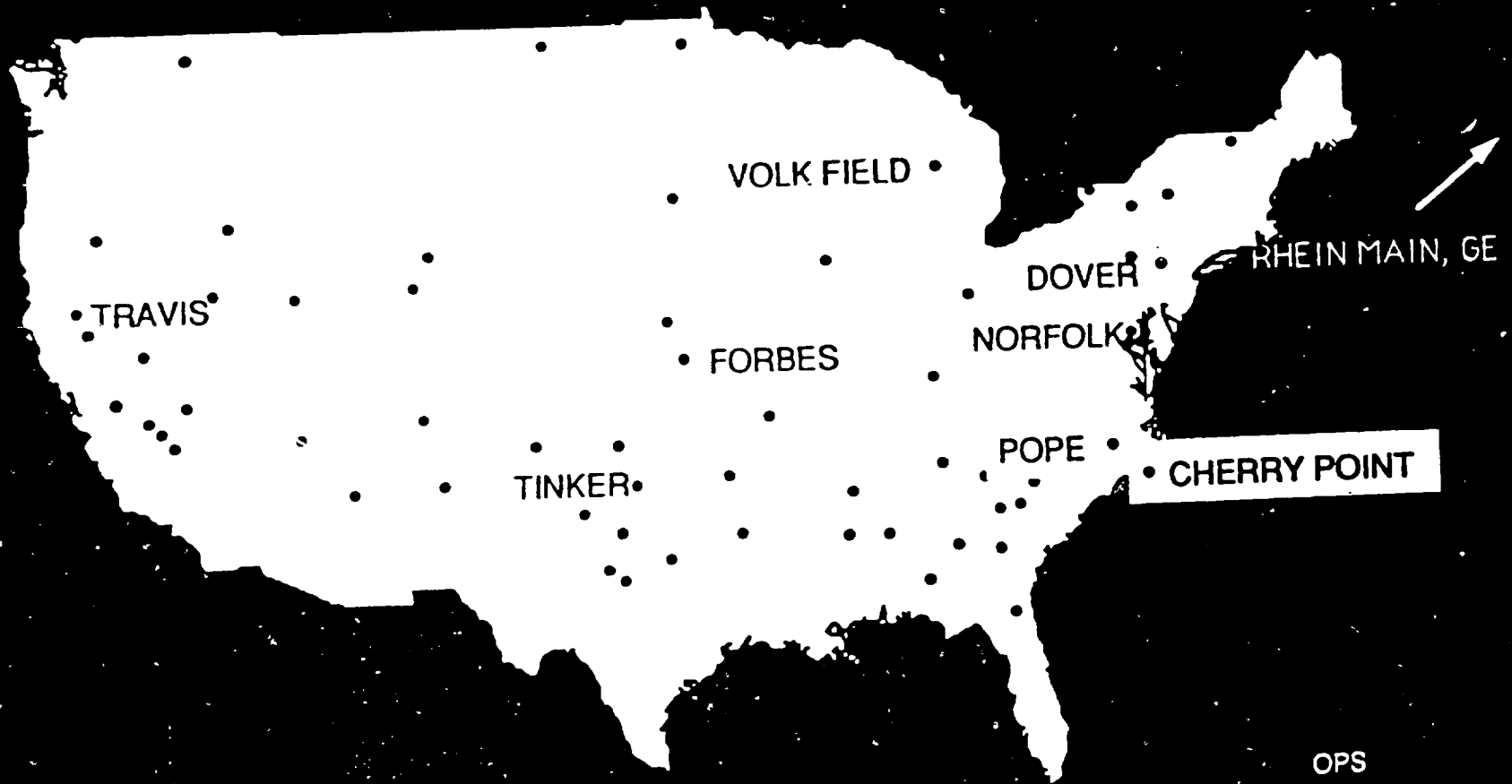


Figure 1

PRIMARY CONUS AERIAL PORTS

PHASE I / II



VILSECK
GARLSTEDT - 2ND ARMD DIV
FRANKFURT - 3RD ARMD DIV - RHEIN-MAIN
RAMSTEIN
VAIHINGEN - STUTTGART
NÜRNBERG - 2ND ARMD CAV REGT
ANSBACH - 1ST ARMD BDE
HEIDELBERG - 1ST COMBAT AVN BDE
EUROPEAN UNIT LOCATIONS
PHASE II EUROPEAN APOES

Figure 3

The following additional Army units deployed or prepared to deploy to the AOR after President Bush ordered additional military forces to build an offensive capability:

U.S. ARMY

VII Corps Headquarters

3rd Armored Division

1st Armored Division

1st Infantry Division (Mechanized)

2nd Armored Division (FWD)

2nd Corps Support Command

2nd Armored Calvary Regiment

Additional CS/CSS units

"Round-out" Brigades; Activated/Training

48th Infantry Brigade (Mechanized)

24th Infantry Division (Mechanized)

155th Armored Brigade

1st Calvary Division

256th Infantry Brigade (Mechanized)

5th Infantry Division (Mechanized)

U.S. Marine Corps

1st Marine Expeditionary Force (I MEF) composed of the following major elements:

- >> Command Element from Marine Corps Base, Camp Pendleton, California
- >> 1st Marine Division, Camp Pendleton, California
- >> Marine Corps Air Ground Combat Center, Twentynine Palms, California
- >> 2nd Marine Division, Marine Corps Base, Camp Lejeune, North Carolina
- >> 3rd Marine Aircraft Wing, Marine Corps Air Station El Toro, California
- >> elements of 2nd Marine Aircraft Wing, Marine Corps Air Station Cherry Point, North Carolina and Marine Corps Air Station, New River North Carolina
- >> 1st Force Service Support Group, Camp Pendleton, California and elements of 2nd Force Service Support Group, Camp Lejeune, North Carolina

Amphibious:

- >> 4th Marine Expeditionary Brigade, Naval Amphibious Base, Little Creek, Virginia, Camp Lejeune, North Carolina, Cherry Point, North Carolina, and New River North Carolina
- >> 5th Marine Expeditionary Brigade, Camp Pendleton, California and El Toro, California
- >> 13th Marine Expeditionary Unit, Camp Pendleton, California

U.S. AIR FORCES

314th Tactical Airlift Wing C-130)	Little Rock AFB, Arkansas
317th Tactical Airlift Wing (C-130)	Pope AFB, North Carolina
435th Tactical Airlift Wing (C-130)	Rhein Main AB, Germany
1st Tactical Fighter Wing (F-15C/D)	Langley AFB, Virginia
4th Tactical Fighter Wing (F-15E)	Seymour-Johnson AFB, NC
23rd Tactical Fighter Wing (A-10)	England AFB, Louisiana
33rd Tactical Fighter Wing (F-15)	Eglin AFB, Florida
37th Tactical Fighter Wing (F117A)	Tonopah Test Range, Nevada
42nd Bomb Wing (B-52)	Loring AFB, Maine
93rd Bomb Wing (B-52)	Castle AFB, California
117th Tactical Recon Wing (RF-4)	Birmingham ANG, Alabama
354th Tactical Fighter Wing (A-10)	Myrtle Beach AFB, SC
363rd Tactical Fighter Wing (F-16)	Shaw AFB, South Carolina
366th Tactical Fighter Wing (FEF-111)	Mountain Home AFB, Idaho
552nd Airborne Warning and Control Wing (E-3 AWACS)	Tinker AFB, Oklahoma
RC-135 Reconnaissance Aircraft	Offutt AFB, Nebraska
48th Tactical Fighter Wing (F-111F)	RAF Lakenheath, UK
52nd Tactical Fighter Wing (F-4G)	Spangdahlem AB, Germany
401st Tactical Fighter Wing (F-16)	Torrejon AB, Spain

Strategic Air Command KC-10 and KC-135 aircraft, aircrews, and maintenance support personnel deployed from the following locations:

Altus AFB, Oklahoma
Barksdale AFB, Louisiana
Beale AFB, California
Carswell AFB, Texas
Castle AFB, California
Dyess AFB, Texas
Ira C. Eaker AFB, Arkansas
Eielson AFB, Alaska
Ellsworth AFB, South Dakota
Fairchild AFB, Washington
RAF Fairford, UK
Grand Forks AFB, North Dakota
Griffis AFB, New York
Grissom AFB, Indiana
Kadena AB, Okinawa Japan
K.I. Sawyer AFB, Michigan
Loring AFB, Maine
March AFB, California
McConnell AFB, Kansas
Minot AFB, North Dakota
Pease AFB, New Hampshire
Plattsburgh AFB, New York
Seymour-Johnson AFB, NC
Warner Robins AFB, Georgia
Wurtsmith AFB, Michigan

<u>The following Combat Logistic Support Squadrons (CLSS) deployed</u>:

401st CLSS — **Wright-Patterson AFB, Ohio**
2849th CLSS — **Hill AFB, Utah**
2952nd CLSS — **McClellan AFB, California**
2953rd CLSS — **Tinker AFB, Oklahoma**
2954th CLSS — **Kelly AFB, Texas**
2955th CLSS — **Robins AFB, Georgia**

DESERT SHIELD Airlift Operations

13,600 airlift missions

8,000 air nautical miles

478,000 tons of military cargo

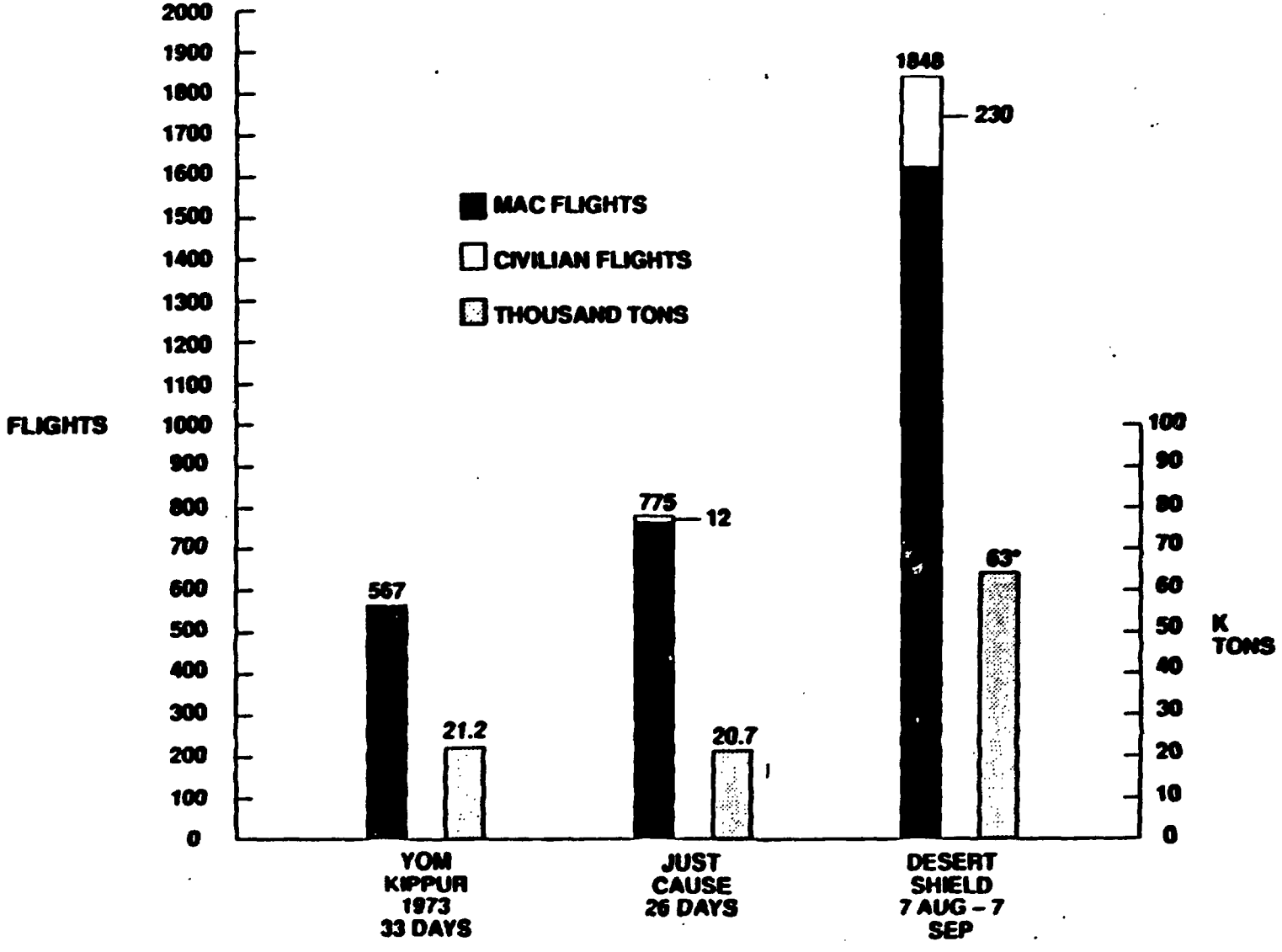
456,000 combat troops

The magnitude of the DESERT SHIELD airlift is easier to comprehend with some historical comparisons. Mr David Garner of the Logistics Management Institute provided the charts at Figures 4 and 5, which illustrate the initial airlift accomplishments for DESERT SHIELD, the Yom Kippur war in 1973 and Operation JUST CAUSE in December 1989. The comparison covers the same approximate elapsed period of time to directly compare the three airlift operations.

However, Operation DESERT SHIELD contained two significant differences from previous operations: Stage I and Stage II activation of the Civil Reserve Air Fleet and large-scale activation of Reserve and Guard forces. The additional lift provided by the Civil Reserve Air Fleet made an enormous difference in the movement of troops and equipment to the combat zone. The massive recall and mobilization of National Guard and Reserve personnel and their equipment more than doubled the airlift forces employed. For the first time, these part-time warriors had the opportunity to demonstrate their combat mission readiness in a modern, high technology war and in a harsh environment.

MILITARY AIRLIFT COMMAND

FLIGHTS/TONNAGE

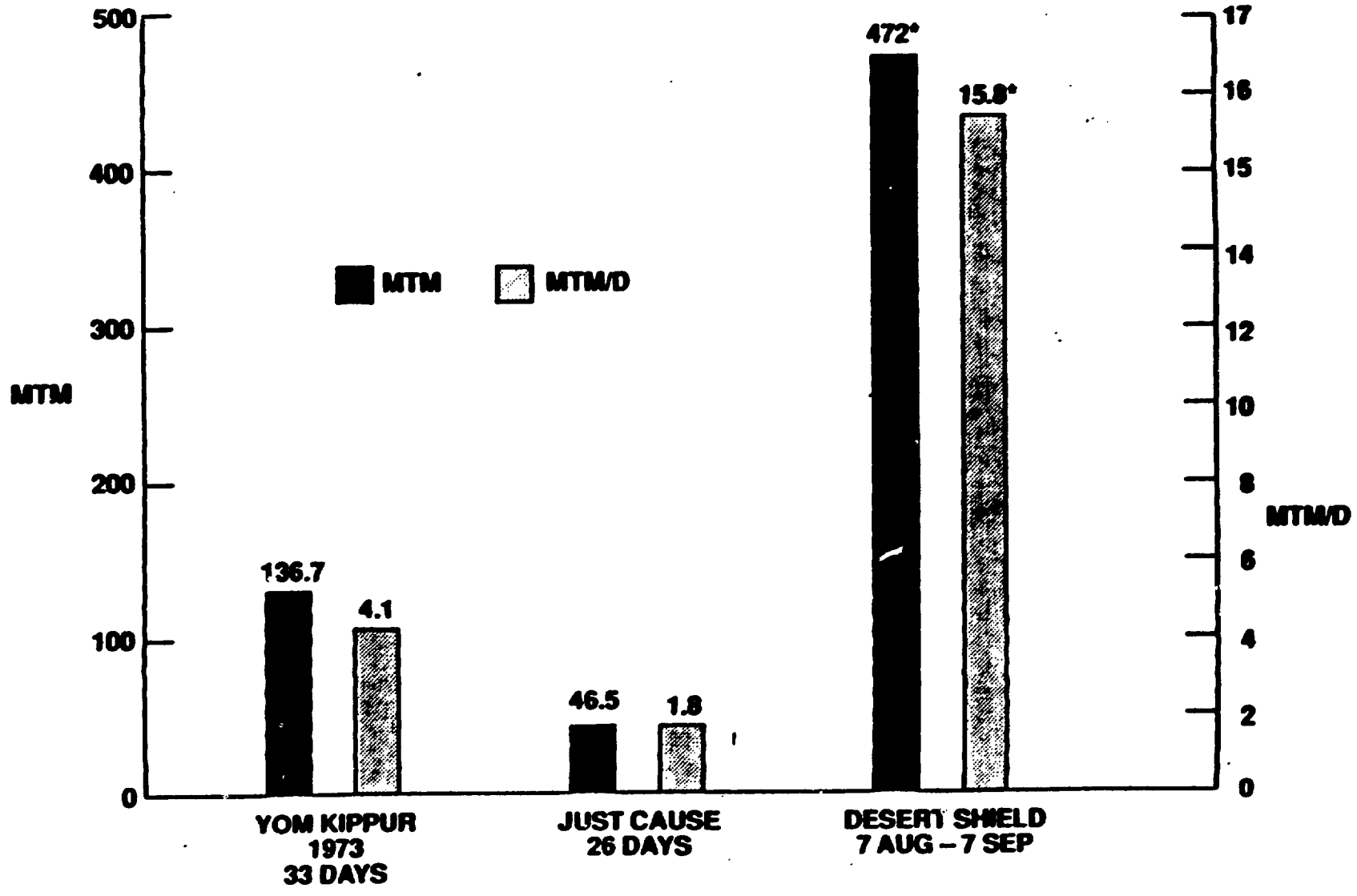


* *Does not include C-130 self-deploying flights/tonnage*

Figure 4

MILITARY AIRLIFT COMMAND

MILLION TON MILES (MTM)
MILLION TON MILES/DAY (MTM/D)



* Does not include C-130 self-deploying flights/tonnage

Figure 5

The Military Airlift Command established enroute aircrew staging locations at separate locations for C-5s and C-141s to prevent saturation of facilities and to take advantage of airplane specific infrastructure already in place at certain locations in CONUS and Europe. Figures 6 and 7 show those routes used by each airplane in support of DESERT SHIELD.

Effective utilization of the C-5 and C-141 airframes required each mission to offload its cargo in the AOR and then fly all the way back to the European stage location for recycle. The typical flying time from the U.S. east coast was 8 hours to Europe, 8 hours to Saudi Arabia, nine hours back to Europe, and then nine hours back to the east coast.

Thus, the typical mission departing from Europe required a maximum crew duty day to fly to the AOR and then return. To facilitate that scenario, MAC established an extra pool of pilots in Europe at each stage location to augment the normal crews arriving from CONUS. The extra pilot would join the crew departing Europe and augment the pilot portion of the crew to the AOR and return. Then the pilot would drop off that crew, enter crew rest for 24 hours, and prepare for the next round trip. Initially, the extra pilot extended the aircrew's legal crew duty time to 24 hours. However, on 7 February 1991, MAC increased the downrange augmented crew duty day to 26 hours (see Attachment 9).

Concept of Operations

C-5

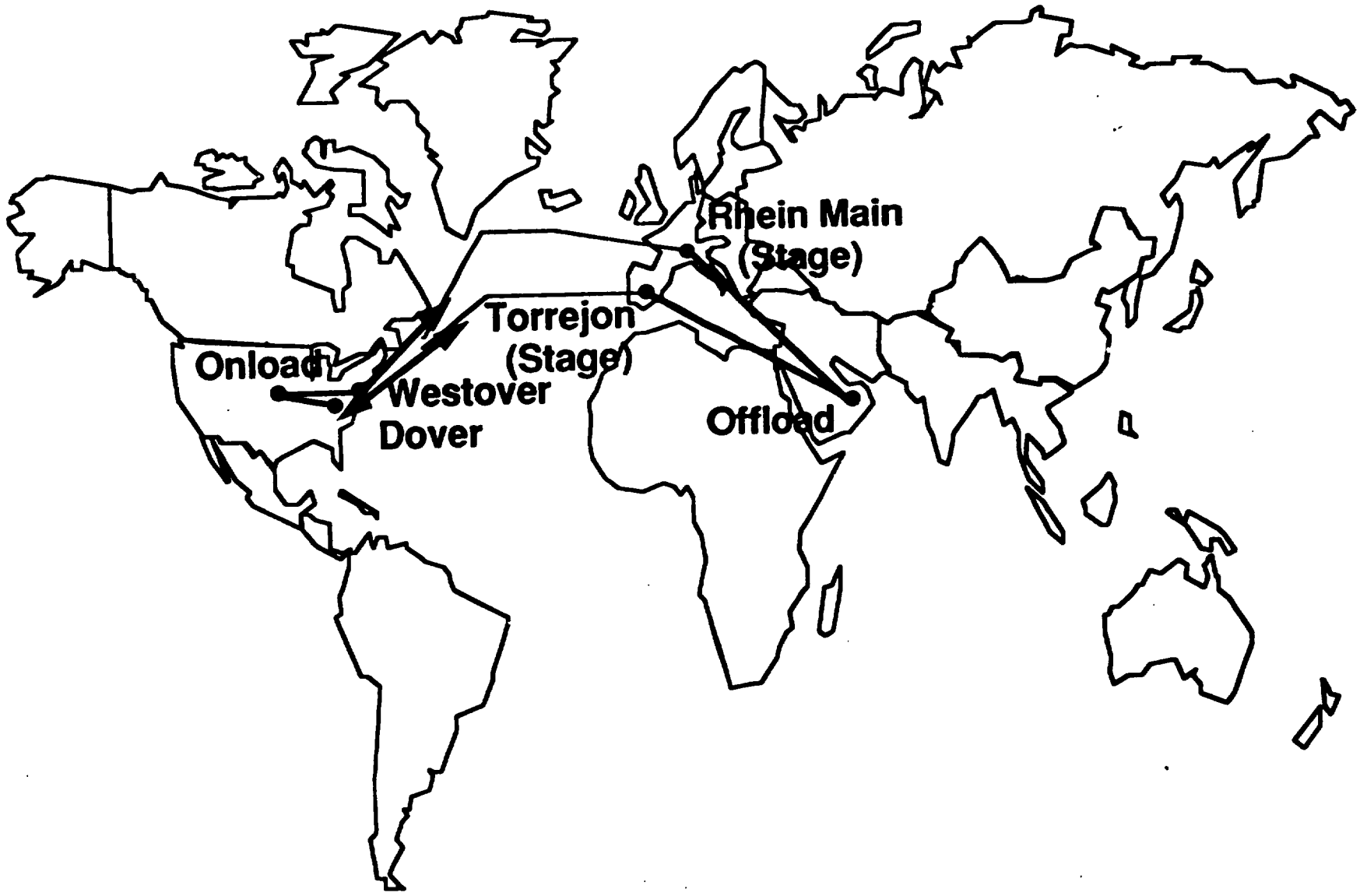


Figure 6

Concept of Operations

C-141

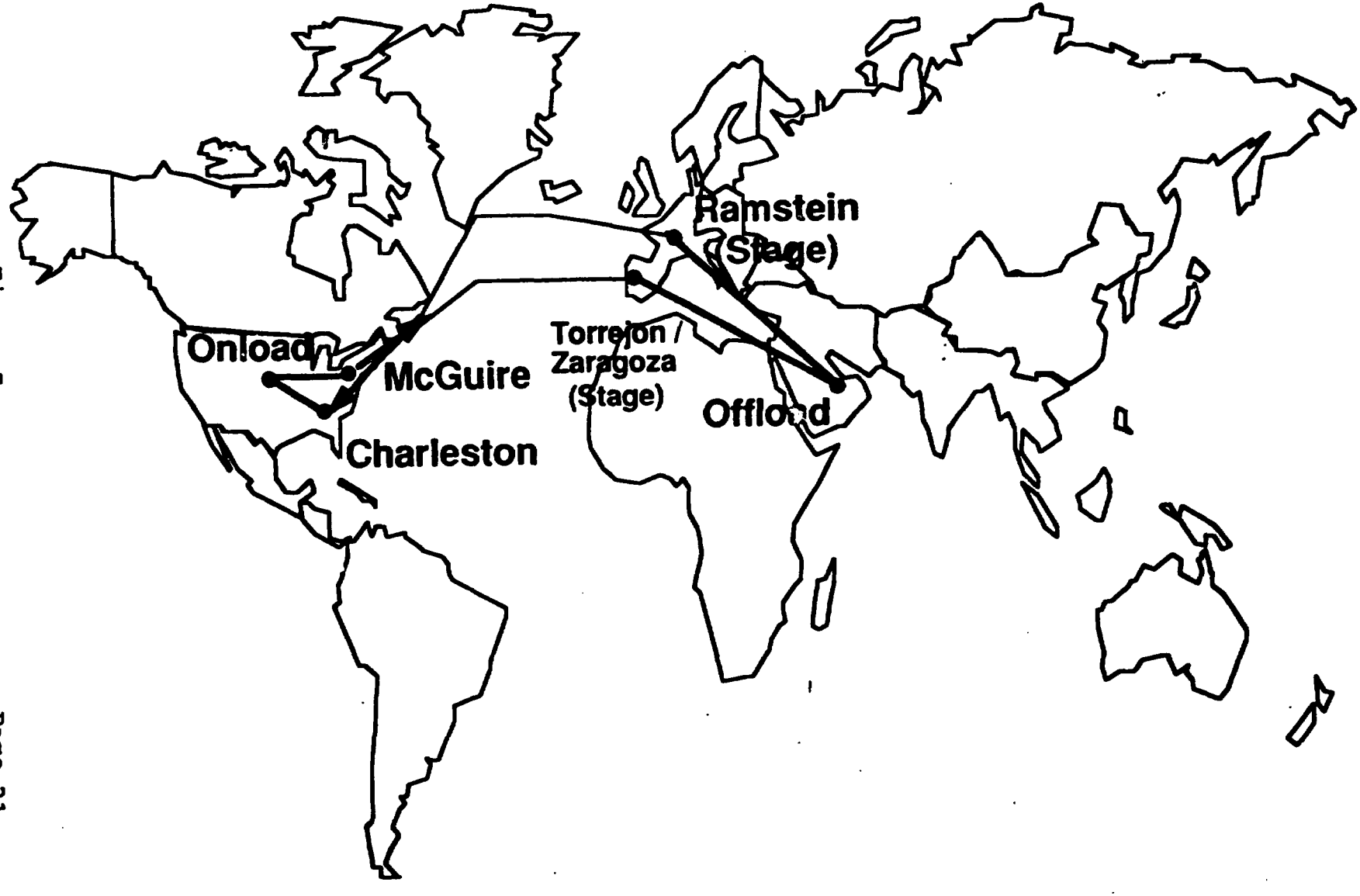


Figure 7

According to Christopher P. Fotos in his Aviation Week and Space Technology article, "American Airlines is assigning five-pilot crews to Civil Reserve Air Fleet (CRAF) flights because otherwise the standard three-pilot DC-10-30 crews would exceed on-duty limits." Enroute servicing delays added to the crew duty day duration and severely reduced airlift mission effectiveness. In a related article, James Ott reported on the House hearing in early October 1990 which reviewed the CRAF performance in Operation DESERT SHIELD. One of the complaints registered during the hearings was the need for "improved arrangements for ground service of commercial aircraft at military bases and enroute stops, providing for diplomatic clearances and fuel allocations."

The workload at some locations in the AOR completely overloaded facilities and resources. A shortage of refueling trucks made that problem severe at times. The article, "Twelve Reserve Squadrons Activated to Help MAC with Saudi Airlift." in Aviation Week & Space Technology discussed the initial surge in MAC airlift operations and some of the early problems. Brigadier General Cole - the Assistant Deputy Chief of Staff for Operations at Military Airlift Command - confirmed "that MAC initially had difficulties refueling in Saudi Arabia because of the limited number of fueling points at airfields there. One C-5 pilot reported waiting six hours on the ground to have his aircraft refueled with about 200,000 pounds of JP-4 to return to Europe."

In spite of the difficulties, The MAC airlift team delivered a historic quantity of equipment and numbers of troops in minimum time. The MAC Command Center Operations Administration staff provided the graphs at Figures 8 through 10. Figure 8 shows the total number of airlift missions by strategic C-141, C-5, and CRAF aircraft in direct support of Desert Shield. Figure 9 plots those airlift missions that terminated in the U.S. Central Command's Area of Responsibility (AOR). Figure 10 plots the commercial air carrier missions flying on MAC contract during the period indicated.

The MAC Historian provided the spreadsheet at attachment 1, which recorded the arrival date, number of missions, number of passengers, and the amount of cargo tonnage offloaded in the AOR. Using that spreadsheet, Mr David Garner of the Logistics Management Institute plotted the numbers in 10-day increments and developed the graphs at Figures 11, 12, and 13. Passenger and cargo tonnage delivery rates directly follow the pattern of mission frequency. Strategic decisions made at the Presidential level drove the magnitude and frequency of airlift missions. The initial surge to deploy defensive forces from 7 August 1990 to the first part of November shows as the first peak in Figures 8 through 13. The second phase of airlift operations started early November 1990 after President Bush directed the Commander of the U.S. Central Command to acquire and develop offensive military operations capability.

Anatomy of an Airlift

Total Missions Committed to Desert Shield

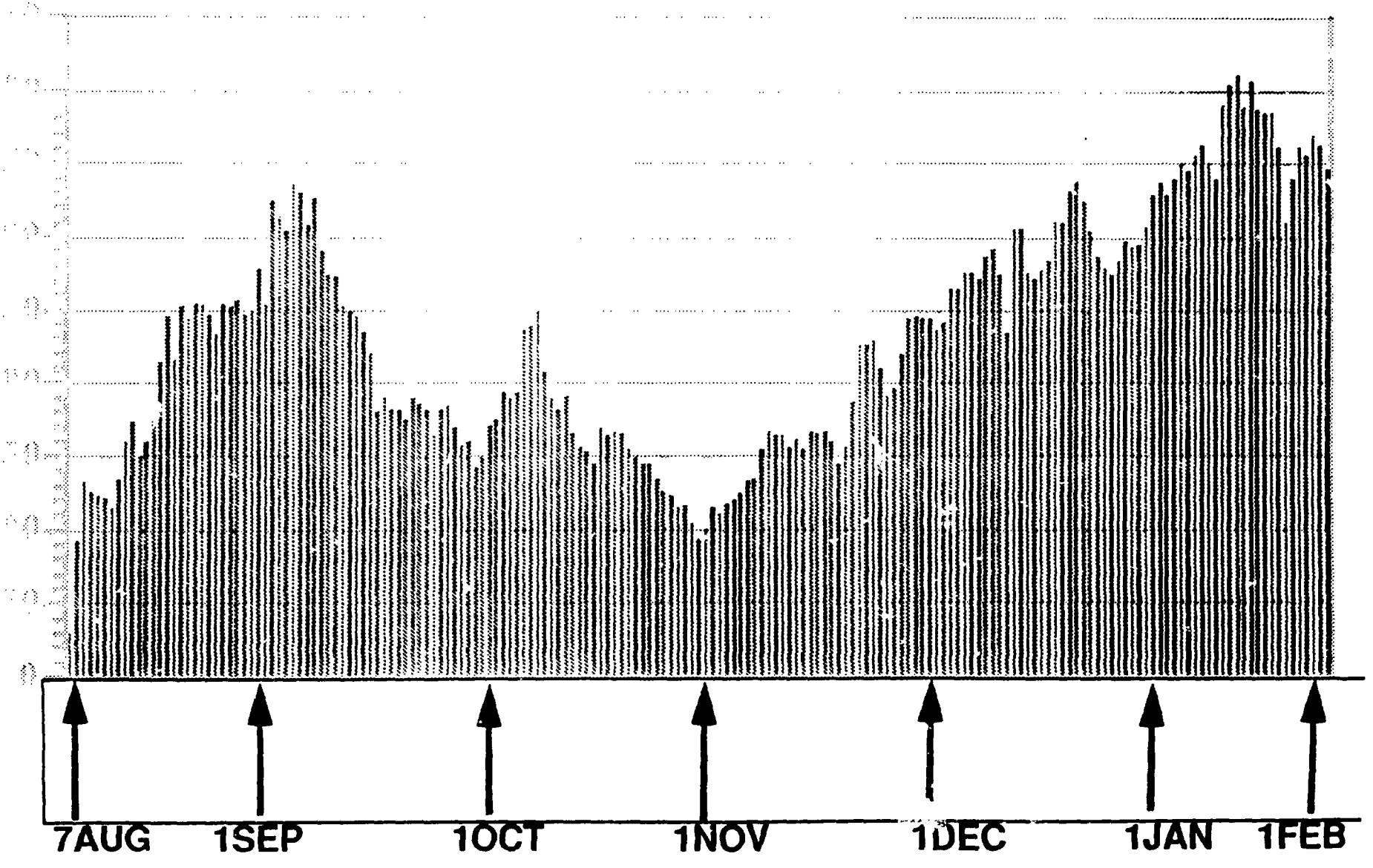


Figure 8

Missions Arrived in AOR

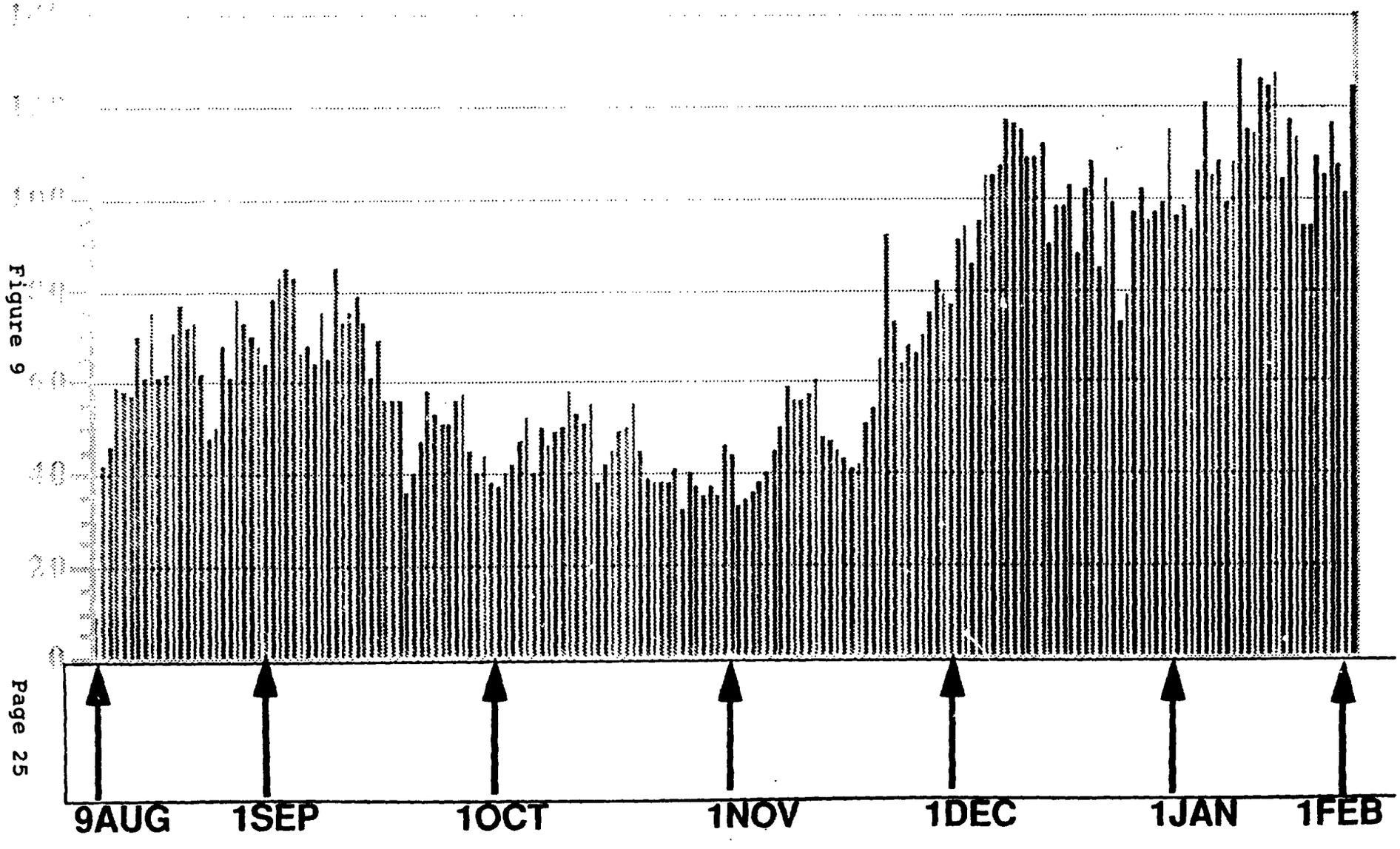


Figure 9

COMMERCIAL AIRCRAFT OPERATIONS

AS OF 132359Z JAN 91

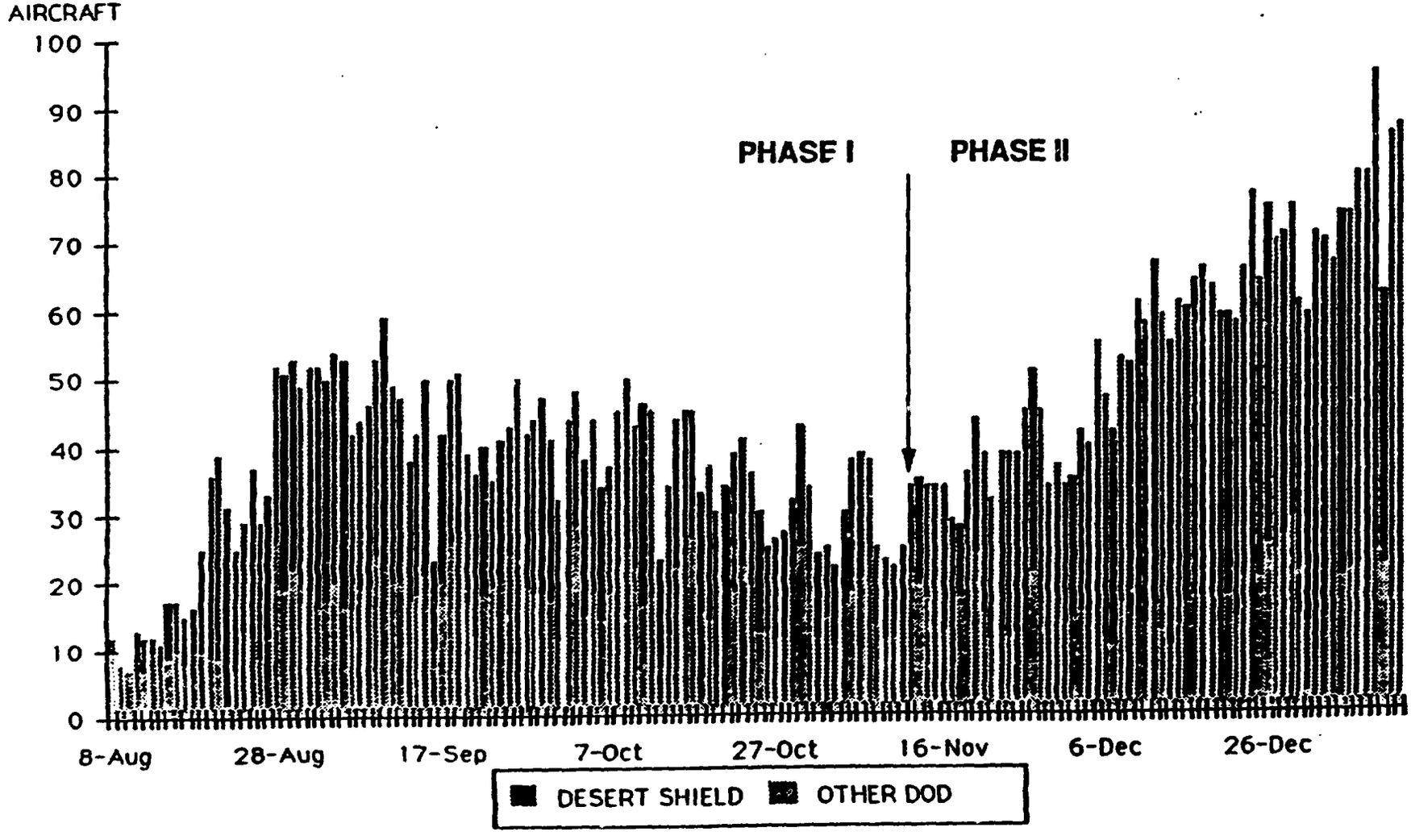


Figure 10

OPERATION DESERT SHIELD
STRATEGIC AIRLIFT DEPLOYMENT MISSIONS
(Excluding Support Missions)

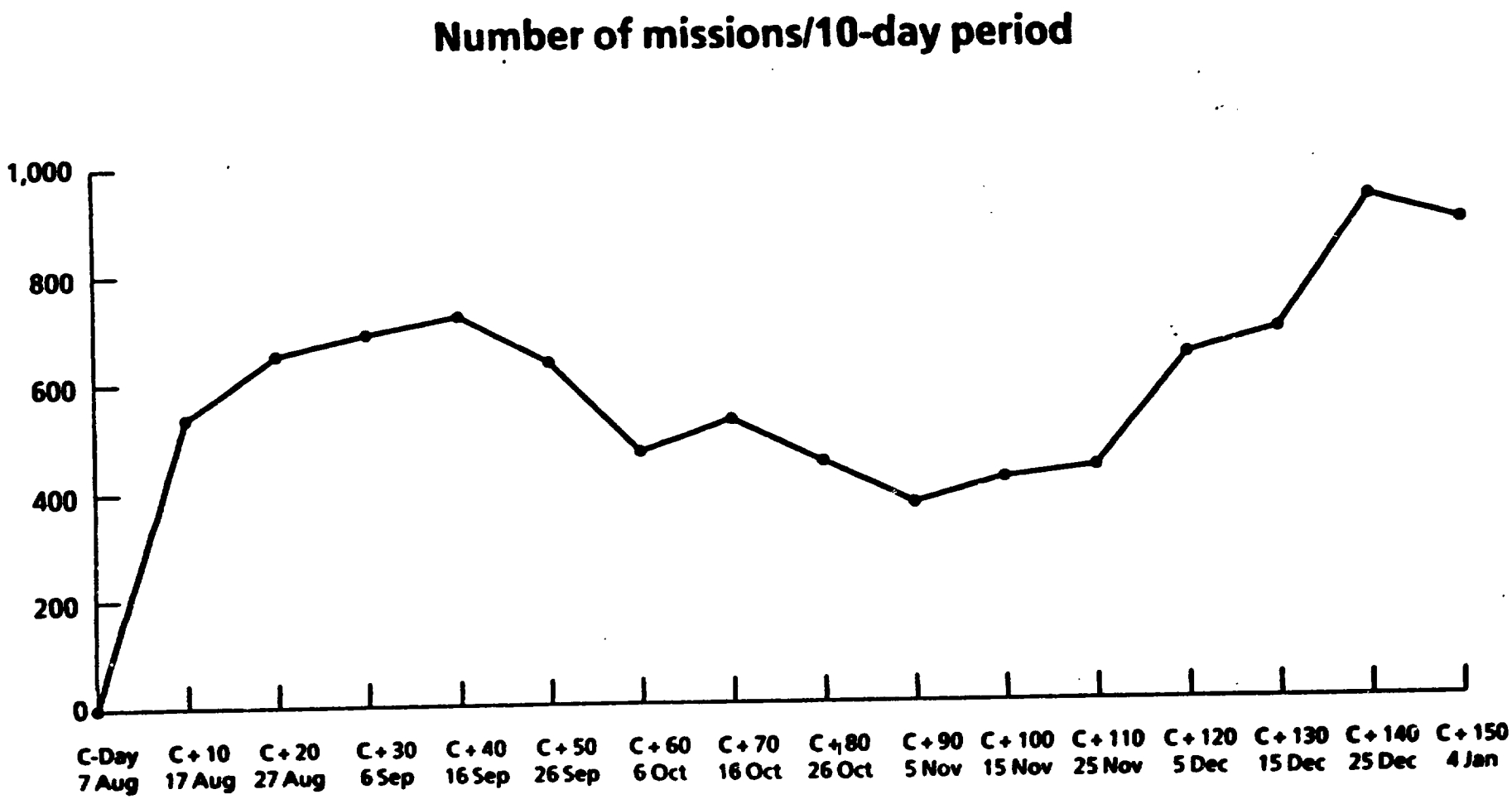


Figure 11

OPERATION DESERT SHIELD

STRATEGIC AIR TONNAGE MOVEMENT

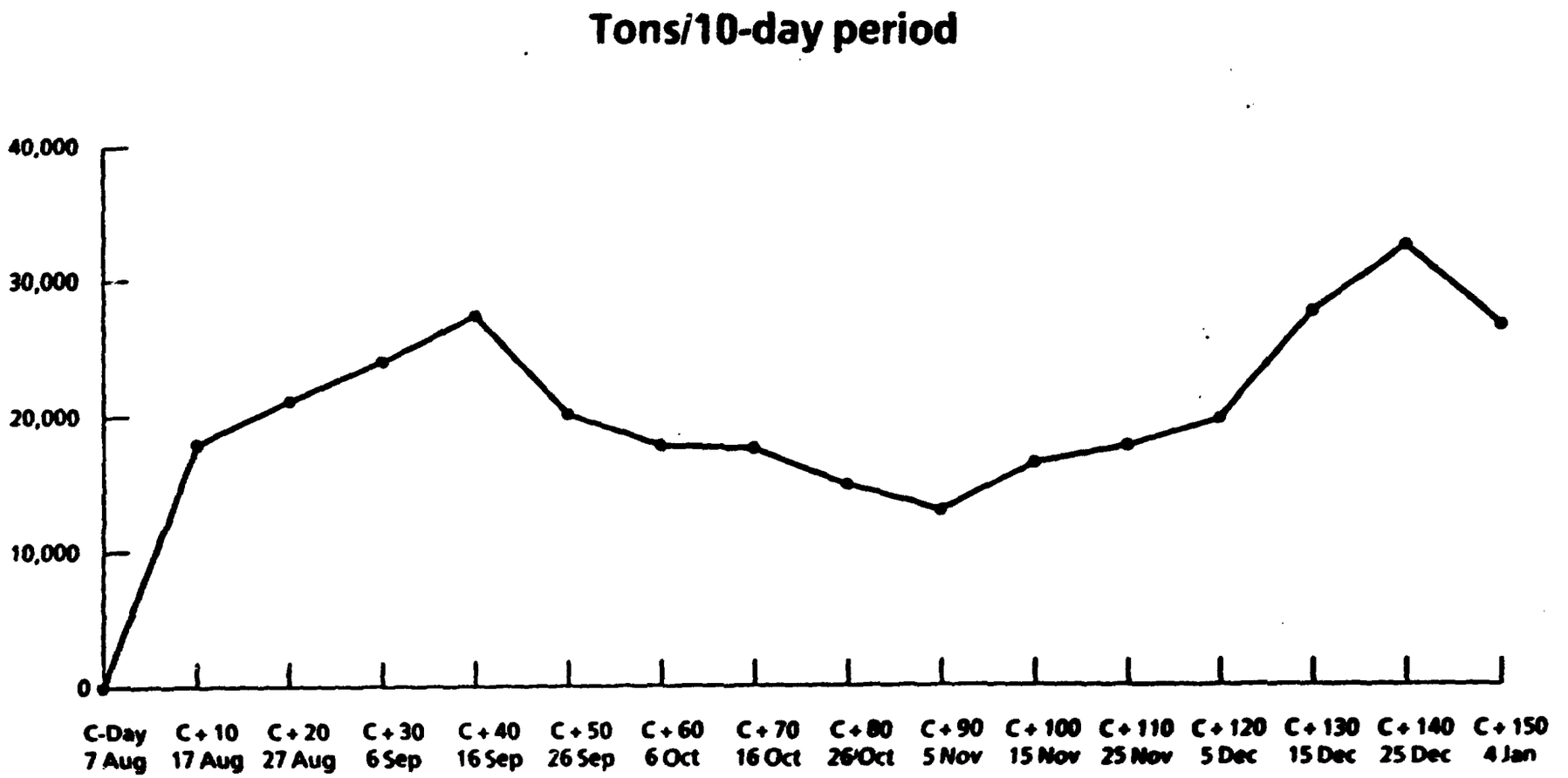


Figure 12

OPERATION DESERT SHIELD

STRATEGIC AIR PASSENGER MOVEMENT

Personnel lifted/10-day period

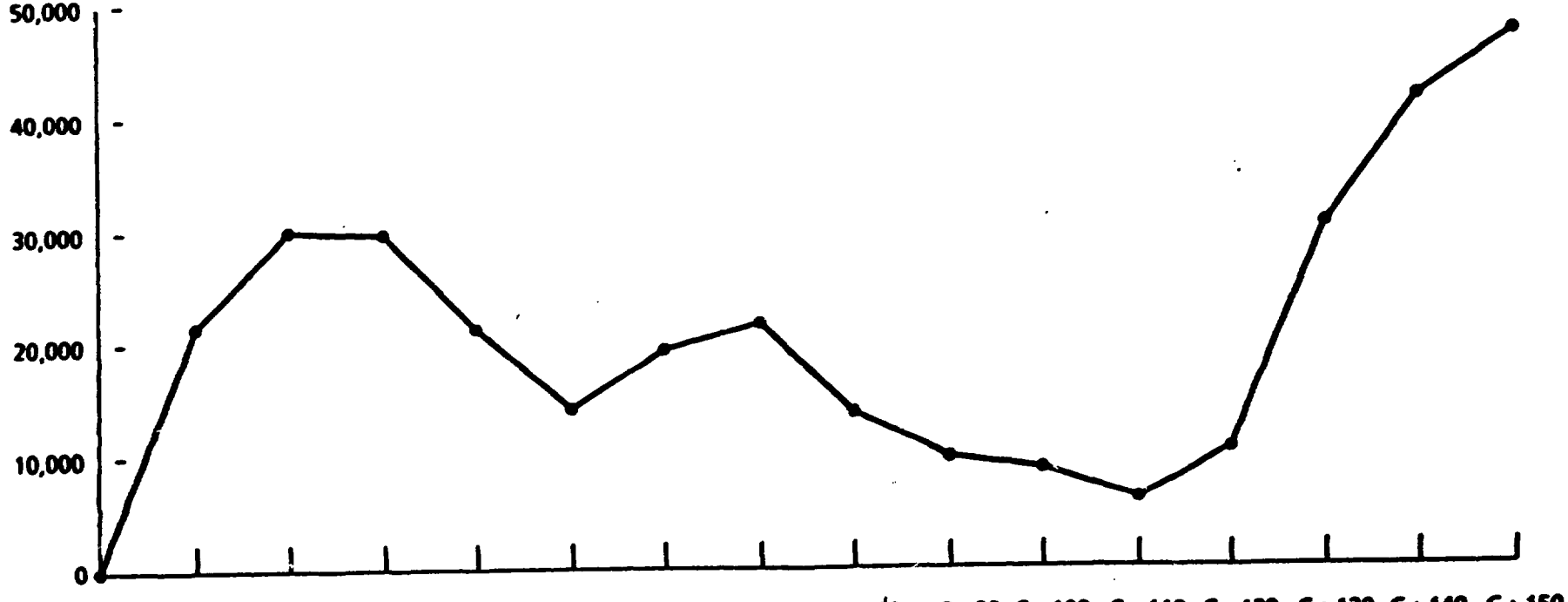


Figure 13

The MAC staff provided airlift delivery statistics by each type of airlift aircraft. Figures 14, 15, and 16 show charts of the missions, cargo tonnage, and number of passengers delivered by aircraft type. Evaluation of the charts show the unique utility and effectiveness of the individual aircraft. While the smaller and more abundant C-141 aircraft flew 52.7 percent of the total number of missions, it could deliver only 29 percent of the cargo and 17.6 percent of the passengers. On the other hand, the C-5 clearly demonstrates its heavy lift capability by delivering 42.4 percent of the total cargo tonnage in only 24.2 percent of the airlift missions flown. In a similar manner, the configuration and airframe design of the commercial wide-body jumbo jets, their high enroute speed, and their quick turn-around times at the offload stations enabled the commercial carriers to deliver a full 63.6 percent of the troops to the AOR in only 21 percent of the missions.

The magnitude, pace, and logistics of the airlift operation to the Persian Gulf area was several orders of magnitude above anything attempted before. The flight procedures through the Mediterranean region and then into Southwest Asia were hectic and even confused at times. Communication with air traffic controllers was difficult and the high airlift mission flow rates sometimes overwhelmed the air traffic control system capability in some of the Flight Information Regions. Many pilots were unfamiliar with the European, Mediterranean, or Persian Gulf flight procedures, location identifiers, or communications procedures for the region.

Strategic Airlift Missions
7 August 1990 to 31 January 1991

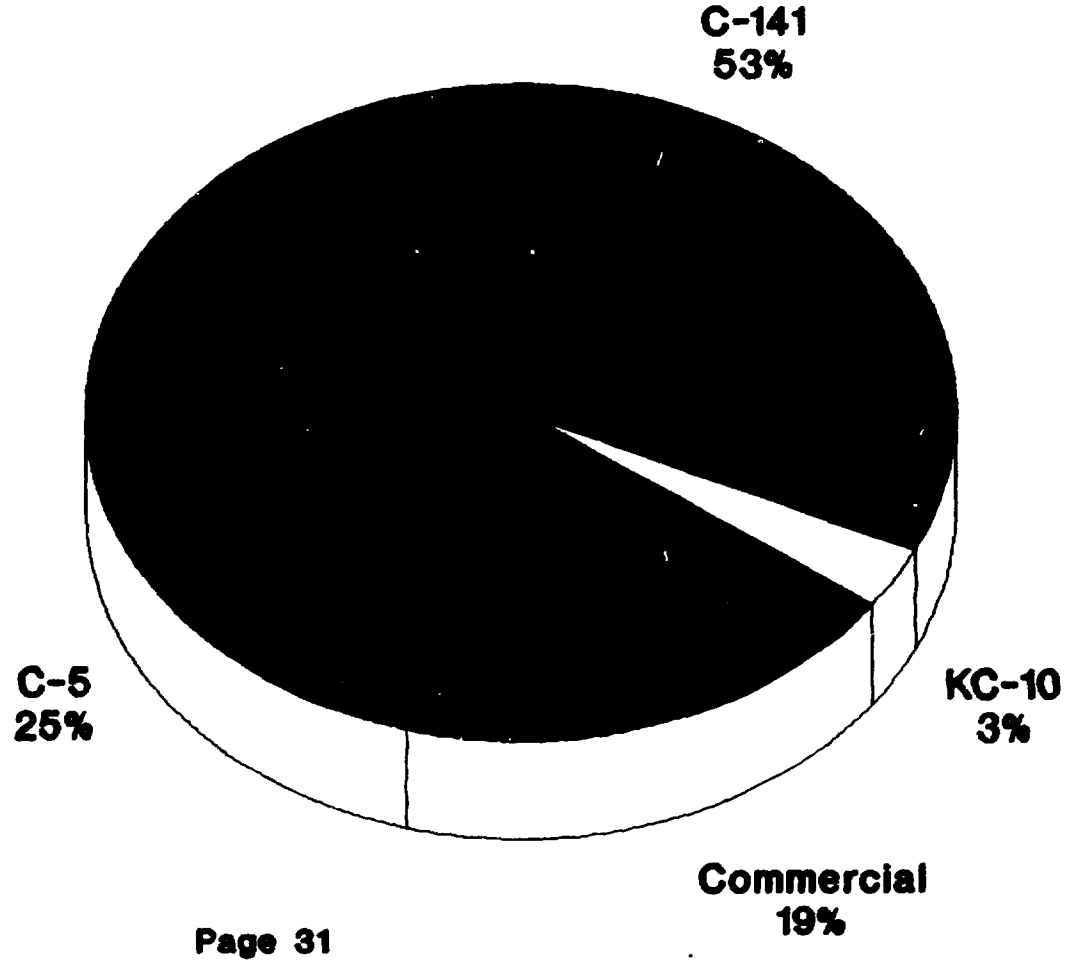


Figure 14

Strategic Airlift Cargo (Tons)
7 August 1990 to 31 January 1991

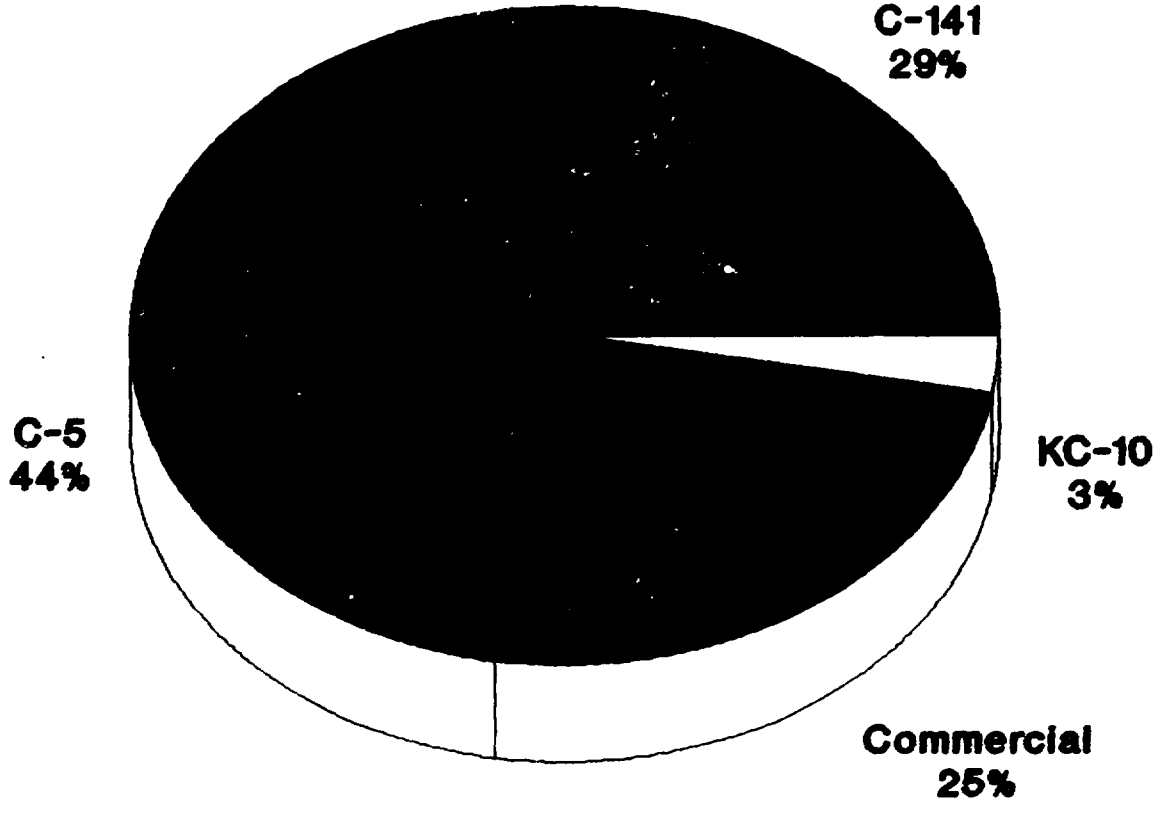


Figure 15

Strategic Airlift Passengers
7 August 1990 to 31 January 1991

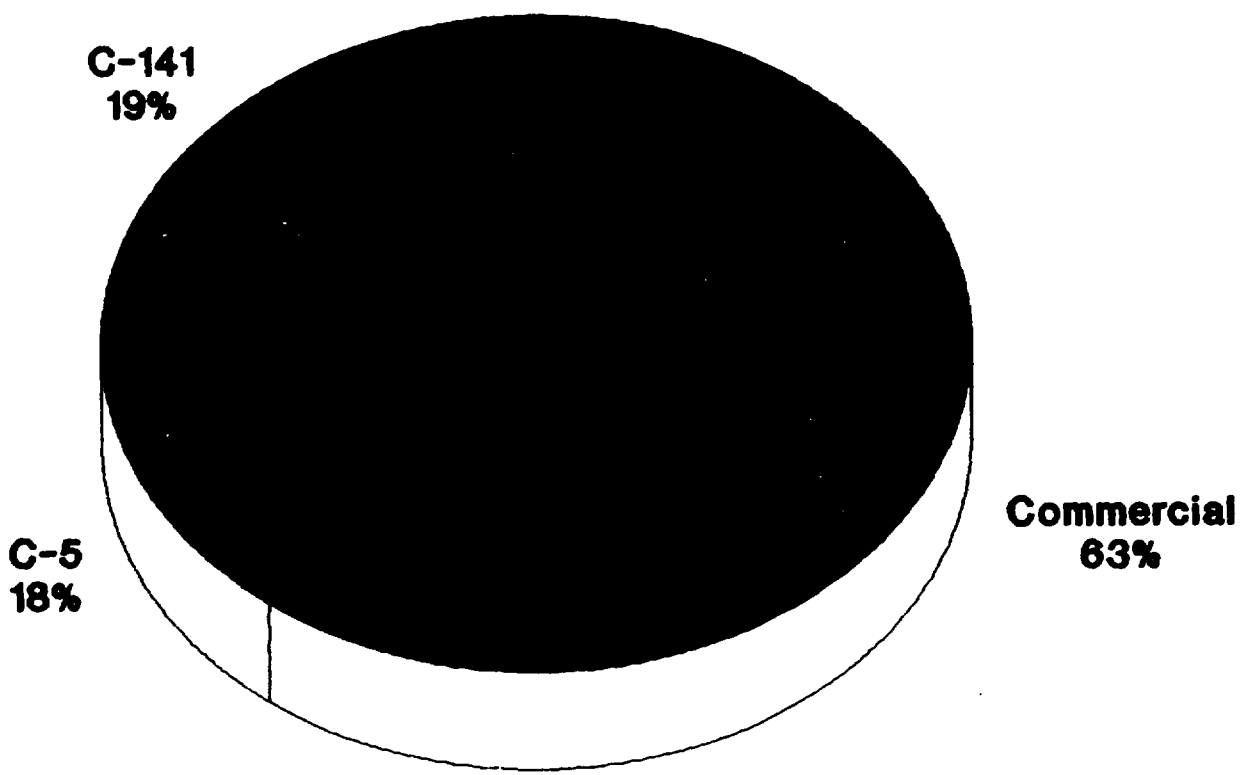


Figure 16

To help spread the word to aircrews flying to the AOR, flying units collected current information and published handouts for the aircrews about mission details, air traffic control procedures, command and control protocols, and security arrangements. One example of those aircrew information brochures is located at attachment 2. It was intended for C-141 or C-5 aircraft commanders operating DESERT SHIELD missions. The brochure was produced early in the airlift deployment effort (probably September 1990) by the 60 Military Airlift Wing at Travis AFB, California. It was an excellent collection of pilot experiences on some of the first missions to the AOR and hints of the chaos during the early days of the flow.

America's strategic airlift assets reside primarily in the Military Airlift Command (MAC) and in the Civil Reserve Air Fleet (CRAF). The exception is Strategic Air Command's KC-10 Extender airplane. It has a dual role of both cargo transport and aerial refueling - normally associated with a tactical fighter wing deployment overseas. In practice, however, the Military Airlift Command's C-5s and C-141s carry the burden of intercontinental strategic airlift, while C-130s traditionally accomplish the intra-theater, tactical airlift chores. One special note: C-141 aircraft fitted with special medical equipment, hardware, and aeromedical aircrews normally accomplish the aeromedical evacuation of casualties from the theater of operations to CONUS medical facilities. All C-141 and C-5 aircraft, including those possessed by the Air Force Reserves and the Air National Guard, flew strategic airlift missions for Operation DESERT SHIELD. The number "available" fluctuated periodically with unscheduled field maintenance repairs, scheduled isochronal inspections, or scheduled depot maintenance.

Aircraft	Possessed	Available	Desert Shield Usage Rates
C-5	113	89	90-95 %
C-141	230	195	90 %

...Sources: MAC/PA and Logistics Management Institute

The major concern with the military airlift fleet is the elderly age of its airplanes. The average age of the C-130 fleet exceeds 26 years. The C-141 fleet is over 25 years old and C-5As are 19 years old. The second production run of 50 C-5s for the B-model aircraft started over 5 years ago. The age, fatigue factors, and usage rates for the C-141 fleet have become pressing issues in U.S. military strategic airlift fleet management. According to David F. Bond's article in the 27 August 1990 issue of Aviation Week & Space Technology, the average age of the C-141B fleet is 31,000 clock hours. A few C-141s have accumulated nearly 40,000 equivalent hours. Cracks in the outer wing joint near the outboard engine pylon necessitated 100 percent inspections and repairs on 110 of the aircraft. Even with the urgency of DESERT SHIELD airlift requirements, MAC fleet managers maintained the flight restrictions on the C-141 which reduced the normal allowable cargo load of 75,000 pounds - by 24,000 pounds - down to 51,000 pounds.

The C-5A Galaxy completed a fleet-wide replacement of its internal wing structural beams several years ago. In addition, fifty C-5B model airplanes from a second production run joined MAC's airlift team. As a result, C-5 fatigue factors were not a factor in the DESERT SHIELD airlift. In fact, many C-5s missions operated at the wartime maximum allowable takeoff weight of 840,000 pounds, instead of the normal maximum of 769,000 pounds. The huge payload capability of the C-5 and its strategic reach made it especially productive in the DESERT

SHIELD airlift operation. By 20 February 1991, C-5s had flown 24 percent of the missions to Saudi Arabia but had delivered a disproportionate 42 percent of the cargo tonnage. And a considerable amount of that equipment could not fit inside any other airplane.

However, other problems with both the C-141 and C-5 airplanes existed. In the National Journal article "Baptism by Fire," David C. Morrison discussed the 1989 GAO report which revealed a shortage of wartime spare parts for C-5s and C-141s. GAO investigators found only 57 percent of required spares for the C-5 fleet on hand and 64 percent for the C-141 fleet. Apparently, however, this condition did not reduce the effectiveness of either airplane during the Desert Shield airlift surge. A determined surge support effort by the Air Force Logistics Command and routine cannibalization of parts from other airplanes helped alleviate spare parts shortages.

Overall fleet performance during the DESERT SHIELD/DESERT STORM airlift operation was outstanding. Incidents associated with mechanical malfunctions, aircraft systems failures, or inflight emergencies were relatively isolated occurrences - especially considering the massive number of flight hours flown and the unprecedented tempo of operations.

The only major accident associated with a DESERT SHIELD airlift mission was the crash of C-5A number 80228, on 29 August 1990 at Ramstein Air Base, Germany. According to the article, "USAF Investigators Say Inadvertent Thrust Reversal Caused C-5 Crash," the author reported that "'Uncommanded and inadvertent' deployment of an outboard engine thrust reverser probably caused the crash." Nine aircrew members and four passengers died in the crash. The airplane was totally destroyed.

C-5A number 80228 had several minor maintenance malfunctions at the time of the crash, but they were adjudicated not responsible for the crash or the "uncommanded or inadvertent" thrust reverser deployment after takeoff. The accident investigation team conducted an extremely thorough and exhaustive investigation into the cause of the accident. The investigation team included highly experienced C-5 pilots, maintenance officers, safety officers, and other specialists. However, the specific cause of the accident eluded them for several months. They flew hundreds of C-5 simulator missions to duplicate the known flight profile and evaluate the possible causes for the unusual altitude, airspeed, and bank angle parameters that occurred after takeoff.

Finally, the investigation team concluded that the left hand outboard engine thrust reverser had suddenly extended to the full reverse position during the

takeoff and initial climb. They deduced that an electrical power circuit for the thrust reversers had failed during the aircrew preflight checks on the system. The electrical failure disabled the thrust reverser system warning lights in the cockpit and left the thrust reversers on number 1 engine in a partially extended position. The darkness and the semi-concealed position of the thrust reversers on the engine cowling made it impossible for anyone in the airplane to notice the malfunction prior to takeoff.

After takeoff, increasing airloads caused the thrust reversers to snap into the fully extended position - with full takeoff power applied and without activating any warning lights in the cockpit.

The resulting left yaw and severe left wing drag exceeded the flight control authority available to the pilot and the airplane rapidly became uncontrollable. Airspeed peaked at 161 knots and altitude reached only about 80 feet above the ground. The left wing dropped and the combined efforts of both pilots could not raise the left wing, even with maximum right roll on the control wheels. The airplane flew through a grove of trees about one fourth mile from the runway at ninety degrees of left bank (wings vertical), and then impacted the ground in a large fireball. The landing gear was still in the process of retracting into the airplane. Total flight time was 21 seconds.

The aft troop compartment separated from the fuselage and came to rest upside down, just short of the burning wreckage. Two passengers and one loadmaster who were located in the aft troop compartment survived the crash. The loadmaster walked away from what was left of the airplane troop compartment shell without a scratch on him.

The entire aircrew was an Air Force Reserve crew from the 68 Military Airlift Squadron at Kelly Air Force Base, Texas. They were all volunteers for the DESERT SHIELD operation and had already flown one mission to Saudi Arabia. By that time, MAC aircrew management at Ramstein Air Base, Germany was operating by DESERT SHIELD rules, which modified and extended the normal peacetime limitations on crew duty/crew rest provisions. By the time of the crash around midnight local time, the crew had expended about eight hours waiting on their mission alert notification and then another eight hours of preflight duties to get the airplane ready for flight.

After careful study, the accident investigation team concluded that, even though some aircrew fatigue was probably present, the human element was not a direct factor in the cause or conduct of the accident. After the thrust reversers on the number 1 engine deployed to full reverse position - with takeoff power set on the engine and without any warning lights in the cockpit - the flight conditions were

unalterable. The mechanical malfunction and the absence of system information in the cockpit prevented successful pilot intervention. Under those conditions, after the airplane took off, it was not humanly possible for anyone to change the inevitable outcome.

The following day, 30 August 1990, news of the fatalities reached the squadron and families of the victims. Amid their grief, additional news arrived to change their lives even more. National Command Authorities had recalled the remainder of the 68th Military Airlift Squadron to active duty under the Presidential 200K call-up authority. (See notification message at attachment 5). Their report time was not later than 31 August 1991 at 0400 GMT. DESERT SHIELD increased in intensity and in strength.

According to Mr David Garner at the Logistics Management Institute, the CRAF assets included:

CRAF STAGE	PASSENGER % OF CIVIL ASSETS	CARGO % OF CIVIL ASSETS
I	17 aircraft 3 %	21 aircraft 8 %
II	79 aircraft 14 %	108 aircraft 41 %
III	258 aircraft 45 %	217 aircraft 82 %

The CRAF shop at Headquarters Military Airlift Command (MAC/XPXO) orchestrated the effort to augment the military airlift fleet with additional airlift resources from commercial air carriers. The urgency of the deployment and the magnitude of the logistics transportation problem compelled the MAC staff to pursue every possible source of assistance. MAC/XPXO provided a copy of the "Initiatives Taken by MAC to Obtain Civil Airlift in Operation DESERT SHIELD," which is located at attachment 4. The document contains an excellent historical record of the major events relating to CRAF activation and participation in DESERT SHIELD. Reading between the lines, it is also obvious that the MAC staff vigorously pursued every option and opportunity to obtain the needed commercial airlift augmentation.

The Civil Reserve Air Fleet and the commercial aircrews made an enormous difference in the strategic airlift effectiveness for Operation DESERT SHIELD. Equipped with modern wide-body jumbo aircraft, the commercial air carriers were well suited to quickly move massive numbers of troops and large amounts of cargo over great distances. U.S. commercial air carriers started DESERT SHIELD operations on the very first day. Under contract to the Military Airlift Command, two DC-10s departed Pope AFB, NC on 7 August 1990 with 520 troops from the 82nd Airborne Division Ready Brigade. Their destination was Dahahran, Saudi Arabia.

In the crucial days that followed, sixteen different U.S. carriers volunteered thirty aircraft and multiple aircrews for the DESERT SHIELD airlift. Between 7 and 17 August 1990, commercial carriers on MAC contracts flew 109 airlift missions to the Persian Gulf region. By 17 August 1990, the U.S. Transportation Command and the Military Airlift Command realized that more airlift was urgently needed to transport the required defensive military forces to Saudi Arabia to deter an Iraqi invasion. On that date, the Commander of the Military Airlift Command signed an historic memorandum activating CRAF Stage I, effective 18 August 1990, at 0001 GMT. (Attachment 3 in CRAF documentation at attachment 4.) We didn't gain much, however, because volunteerism among the carriers had been running so high that Stage I activation picked up only 10 more airplanes. The good news was that all the airframes were wide-body Boeing 747 jumbo jets.

Even with Stage I activation, the subsequent presidential decision to increase the deployed troop strength and build an offensive military force capability demanded even more airlift capability. The commercial carriers again responded with additional airplanes and aircrews. By mid-December 1990, MAC was using all of the Stage I aircraft plus nine additional cargo and eleven additional passenger aircraft that the commercial carriers volunteered for the "aluminum bridge."

However, Stage I activation and the additional volunteers still wasn't enough. The MAC CRAF shop examined all available options and filtered them through a screen of U.S. Codes, Department of Defense Directives, Public Law, and Federal Aviation Regulations. They also remained very sensitive to the legitimate business concerns of American commercial carriers in their pursuit of additional commercial airlift. The net result of all those directives and additional specific rulings by senior government officials was a varying degree of acceptability of the various options and sources of strategic airlift. The following priority source list evolved from those deliberations:

1. certified CRAF carriers,
2. U.S. non-CRAF carriers after DOD approval,
3. free foreign flag carriers (cargo only),
4. CRAF Stage II Activation,
5. CRAF Stage III Activation, or as a last resort
6. purchase of foreign flag lift.

The CRAF shop staff aggressively pursued every available option. They initiated efforts to secure certification of additional U.S. non-CRAF carriers and recruited several new commercial carriers to join the MAC team. In addition, they examined all available means of obtaining airlift support from friendly or allied foreign nations, including NATO.

There was considerable reluctance to activate Stage II of the CRAF because of the potential disruption to the U.S. air carrier industry. As the MAC Staff had noted, "We have one major carrier that has just declared Chapter 11 bankruptcy and at least three others have stated that they are under severe pressure to take similar action." (Page 3 of Attachment 28 in CRAF package)

The MAC staff successfully recruited two new cargo carriers and two new passenger carriers after Stage I activation. America West, Buffalo Airways, Florida West, and US Air joined the certified ranks and added nineteen airplanes to the fleet. Efforts to obtain free foreign lift met with only very limited success: Korea, Japan, and Italy were among the few.

Finally, on 11 December 1990, the office of the Assistant Secretary of Defense for Production and Logistics approved the USCINCTRANS request for authority to contract for additional cargo airlift from NATO carriers.

However, the Principal Deputy, David J. Berteau, disapproved the request to waive the provisions of Public Law 99-661, which requires DOD charter air carriers to have at least 12 consecutive months experience in providing substantially equivalent service to that requested by DOD. He responded; "The provisions of Public Law 99-661 and implementing DOD regulations will not be waived for either U.S. or NATO air carriers." (Attachment 29 to CRAF package)

In spite of these measures, the shortfall in long range strategic airlift continued. On 17 January 1991, the Secretary of Defense activated CRAF Stage II to obtain additional cargo aircraft. The initial Stage II request was for 18 cargo-configured aircraft. Since nine of them were already in volunteer service above Stage I requirements, activation of Stage II provided access to only nine more cargo aircraft and crews. However, the results were dramatic. CONUS east coast aerial ports witnessed a visible draining of the enormous cargo backlog as countless civilian freighters departed for the Persian Gulf region. The partial Stage II activation clearly hastened completion of the Phase II buildup to deploy offensive military forces.

After the Iraqi invasion, the Military Airlift Command quickly established the airlift pipeline to deploy U.S. defensive military forces to Saudi Arabia. Satellite coverage of the area detected Iraqi forces deployed in formation positions on the Saudi Arabian border as though poised for further excursions into the Saudi Arabian oil fields. MAC Headquarters, Numbered Air Forces, Wings and Groups assembled into their respective Crisis Action Teams and launched their airlift forces into action.

Operations, maintenance, aerial port, and combat support commanders organized mobility-designated personnel for deployment to Europe and Saudi Arabia for airlift enroute support activities. MAC established aircrew stage locations at Ramstein Air Base, Germany, Rhein Main Air Base, Germany, and Torrejon Air Base, Spain. Some of the first airplanes that departed CONUS carried dozens of C-141 and C-5 aircrews to pre-position at the aircrew stage locations.

Due to the Iraqi threat, all aircrews and support personnel deployed with chemical suit kits that contained the required multiple sets of gear, including injection kits. Each aircrew member also carried vest armor and sidearms. Maintenance teams and aerial port personnel also deployed with chemical ground suits, tool kits and required equipment to the European stage locations.

MAC airlift control elements (ALCE) deployed stateside to various on-load locations to help prepare U.S. Army equipment for air shipment to Saudi Arabia. MAC airlift control element cadre personnel also deployed to several airfields in the AOR to establish initial aerial port capability and to operate military and commercial aircraft offload, servicing, and maintenance activities. Mobility designated aerial port and aircraft maintenance personnel accompanied the airlift control elements to the AOR.

All the Air Force Reserve associate airlift squadrons and the Air Force and Air National Guard unit-equipped airlift flying squadrons moved into surge operations alongside the active duty forces. Volunteerism among aircrew, maintenance, aerial port, and support personnel peaked with the news coverage of the Kuwaiti invasion and the world reaction against the aggression. With half of MAC airlift aircrews residing in Guard and Reserve organizations, volunteerism was critical in the first weeks of the airlift effort.

The activation of Reserve and Guard aircrews occurred just in time to continue the initial surge. Most active duty aircrews flew so much in the first 30 days that they reached their maximum flying time limits and had to stand down. The activated Reserve and National Guard aircrews replaced them and maintained the tempo. Thirty 30 days later, they hit the same stops themselves. Then, the lull between Phase I and Phase II allowed both groups to catch up.

Not everything was orderly, however. The article, "Twelve Reserve Squadrons Activated to Help MAC with Saudi Airlift." in Aviation Week & Space Technology discussed the initial surge in MAC airlift operations and the activation of reserve associate airlift flying squadrons. The article referred to unidentified command and control problems that led to sudden replacement of the Deputy Chief of Staff for Operations at MAC Headquarters, along with his equivalent at Headquarters 21 Air Force. There were no public announcements or explanations.

The Aviation Week & Space Technology article also discussed the stretch on aircrew resources. MAC authorities extended normal flying time limitations and crew duty limits to accommodate the simple geographic fact that DESERT SHIELD took place on the other side of the globe. Most of our airlift contingency plans for a large scale airlift effort aimed the logistics pipeline at NATO Europe. In DESERT SHIELD however, the European continent was only halfway to the theater of operations.

First, MAC increased the maximum crew duty times for a basic aircrew from 16 hours to 20 hours. Then at about the 30-day point, MAC extended the 30-day maximum flying time accumulation limits from 125 hours to 150 hours. Normal maximum is 125 hours in any continuous 30-day period of time and 330 hours in any continuous 90-day period.

In every airlift flying squadron, the Flight Crew Information File helps to disseminate important operational information to aircrew members. These notices are used to inform everyone about "need to know" items too recent for other periodic publications. Attachment 3 is a copy of some of the Dover Air Force Base Flight Crew Information Files which relate to DESERT SHIELD. The 436 Military Airlift Wing (MAC) and the 512 Military Airlift Wing (AFRES)(ASSOC) share the 36 C-5 airplanes at Dover AFB. Both wings operated at wartime surge intensity from the very beginning when Iraq invaded Kuwait and U.S. forces deployed to block further aggression. The attached Flight Crew Information Files officially announced the modified DESERT SHIELD aircrew operating rules and crew duty limitations.

The Military Airlift Command had no choice but to extend the aircrew duty limitations. They simply ran out of available aircrews, particularly for C-5 airplanes. Even with all Air Force Reserve and Air National Guard C-5 flying squadrons activated, the intensity of the airlift effort quickly overran the aircrew resources. The airplanes had greater endurance than the aircrews and their daily utilization rate during peak periods exceeded all previous experiences and expectations.

The relationship between the number of available airplanes, the expected airplane utilization rates, and the number of aircrews is called aircrew ratio. Crew ratio defines the number of aircrews per airplane. The actual calculation process is fairly

sophisticated and requires the combined efforts of force structure planning expertise, operational planning, and budget limitations. Computer simulation programs help with iterations through various planning variables. The NATO scenario has dominated airlift planning for decades and resource allocation has generally followed that plan.

According to the Air Staff (USAF/XOOTA) at the Pentagon, the strategic airlift aircrew ratios have been static for several years at 3.02 for C-5s and 3.92 for C-141s, counting all active, guard, and reserve crews. These ratios multiplied by the number of airplanes assigned determine the number aircrew positions in the airlift squadrons. These numbers also set into motion a very large number of budget calculations. Salary, training expenses, supplies and equipment, facilities, management overhead, retirement benefits, and cost of annual flying time to maintain aircrew flying proficiency are some of the expenses incurred with aircrew personnel manning. Small changes in aircrew ratios amplify into major changes in operating budgets.

The operational endurance of C-5s and C-141s also enter into the calculations. The traditional planning factors on C-5 and C-141 aircraft utilization rates were about 12 hours per airplane per day for the first 45 days of the war and slightly less than 10 hours per airplane per day thereafter. Our present aircrew ratios are based on those numbers and the traditional NATO logistics scenario to Europe and return.

To put the C-5/3.02 and C-141/3.92 ratios into perspective, the commercial air carriers use four crews per airplane to keep the aircraft utilization rate up to the point of profitability. In DESERT SHIELD, the intensity of airlift operations during the two main surge periods drove the C-5 and C-141 utilization rates above 13 hours per airplane per day for significant periods of time. The extension of the 30-day flying time limit from 125 hours to 150 hours helped temporarily. However by February 1991, many C-5 pilots had reached their 90 day limits of 330 hours and had to stand down until the moving 90-day window relinquished flying time. To put it simply, the airplanes flew so much that even with the extended aircrew duty limits, the available C-5 aircrews remained the limiting factor.

The other aircrew problem was excessively long crew duty day lengths. While modern aviation technology can easily provide airframes to bridge the intercontinental distances associated with DESERT SHIELD, human factors remain unaffected by those extensions in operational range. Adding extra pilots provides only so much extension to crew duty limits because there is only one aircraft commander. And that person must be in the pilot seat for each takeoff and landing - from the first one to the last.

In DESERT SHIELD, logistic limitations required the aircrews to fly from European stage locations to the AOR and return. The airplanes simply could not stay in Saudi

Arabia nor could an aircrew stage be established there. The facilities necessary to operate an aircrew stage operation in the AOR did not exist. The flying time from Europe to the AOR was about eight hours; the return trip was about nine hours. Adding the initial preflight duties lasting 3 hours 15 minutes to the enroute flying time, the crew duty day totaled about 20 hours 15 minutes plus the ground time in the AOR. The normal maximum crew duty day for an augmented crew (extra pilot added) was initially 24 hours. Therefore, only 3 hours 45 minutes remained to complete the offload and aircraft servicing during the stopover ground time. Actual ground times averaged four to six hours.

Both military aircraft and commercial air carriers experienced frequent delays at the offload airdromes in the AOR. At times, the workload completely overwhelmed the servicing, refueling, and cargo handling capability available. At some of the airports in Saudi Arabia where other types of aircraft operated, the competition for such resources as fuel trucks normally resulted in the MAC airplane getting fuel last, after the fighters and bombers.

On 7 February 1991, MAC authorities extended the military aircrew crew duty day limit from 24 hours to 26 hours - a limit that aircrews had been ignoring anyway. Otherwise, there was simply no way to make it all the way back to Germany or Spain. (See Attachment 9)

The first large scale activation of Reserve and National Guard personnel since World War II brought out several significant issues. The first one is a well deserved recognition for the outstanding volunteerism demonstrated by the dedicated citizen-soldiers, airmen, and sailors of the Reserves and National Guard. Their response to the crisis in the Persian gulf stands as clear testimony to their distinctive brand of citizenship. While most Americans quibbled and complained about the politics of the invasion, over 200,00 members of the Reserves and National Guard responded immediately to the call to arms.

However, several weeks passed before the unit activations provided the needed personnel. In the interim, individual volunteerism produced the massive participation of Guard and Reserve personnel in the initial deployment phase. However, in spite of their magnificent response to the crisis, volunteer availability eventually ran out. People with civilian jobs or businesses simply had to return to work. Without an official, legally binding activation by the President, many reservist or guardsman had no recourse but to respond to their employers's demands to return to work or else.

Another obvious factor in personnel issues was the underestimated length of the crisis. The war effort lasted much longer than the original 90 day activation - and even well beyond the additional 90 day extension. Finally, the President had to

mobilize the Ready Reserves - under different provisions of law - to provide the additional military personnel needed for the required length of time.

Figure 17 and 18 show the magnitude of volunteerism in the Reserves and National Guard. Mr David Garner from the Logistics Management Institute provided Figures 18 through 22. Figures 19 and 20 show the graduated response to changing strategic conditions and the step increases in Selected Reserve call-up under the Title 10 U.S. Code Section 673b (200K). Figures 21 and 22 show the legal switch to a recall of Ready Reserve units under Section 673a and 673c of Title 10 U.S. Code and the Presidential Executive Order of 18 January 1991 titled "Ordering the Ready Reserve of the Armed Forces to Active Duty." Attachment 5 contains samples of notification messages that ordered units to active duty under the 200K call-up authority. Attachment 6 contains documents relating to the second phase Ready Reserve activation.

DESERT SHIELD served to quantify many availability issues with Guard and Reserve forces. As more and more military capability ends up in the hands of the "weekend warriors," war planners must cope with the reality of their restricted access to such resources. For many years, Congress reduced the DOD budget by reducing the number of active duty personnel and transferring their equipment and responsibilities to the National Guard and the Reserves.

RESERVE AND NATIONAL GUARD VOLUNTEERS
OPERATION DESERT SHIELD

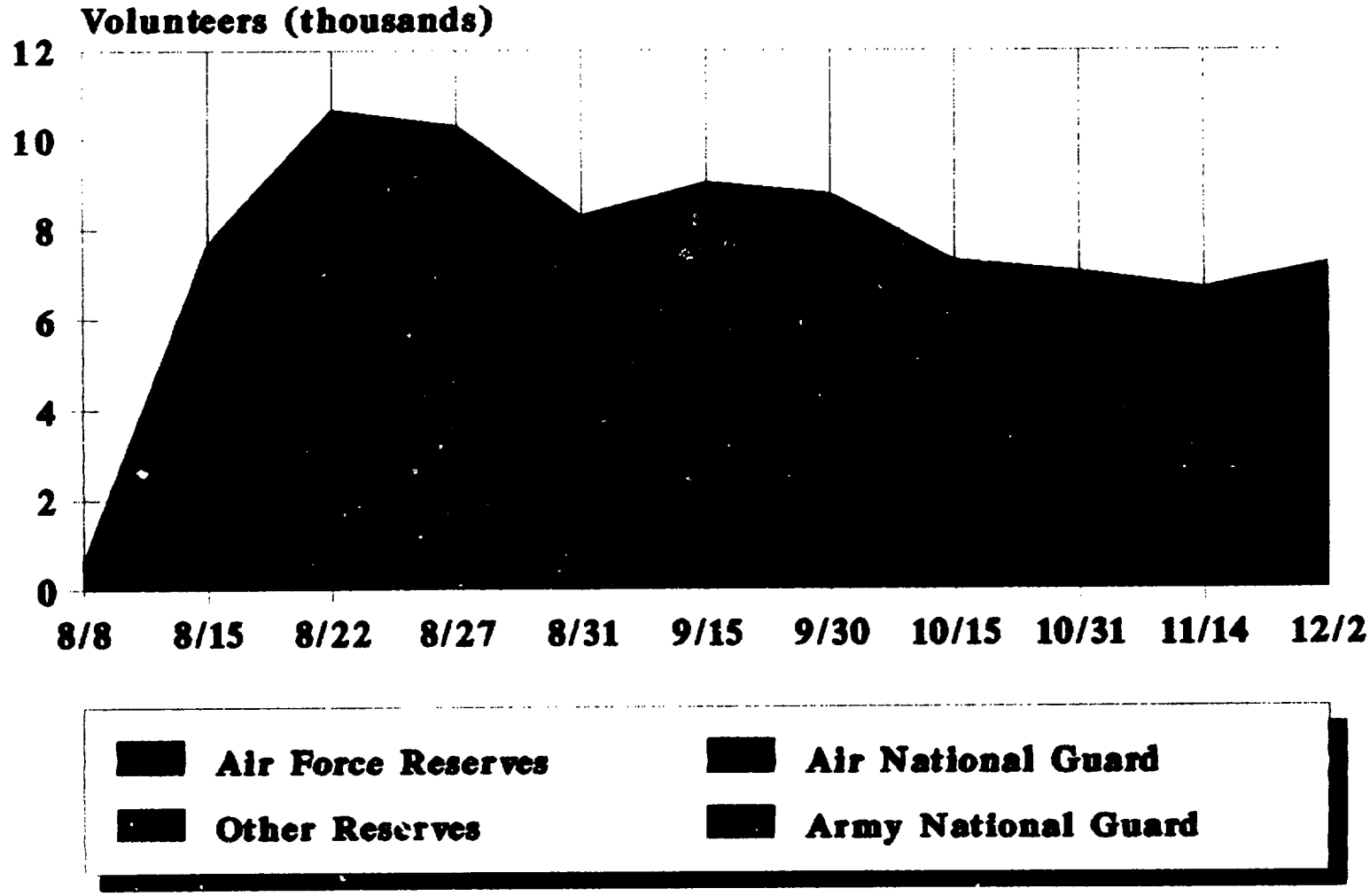


Figure 17

RESERVE COMPONENT VOLUNTEERS

SUPPORTING DESERT SHIELD

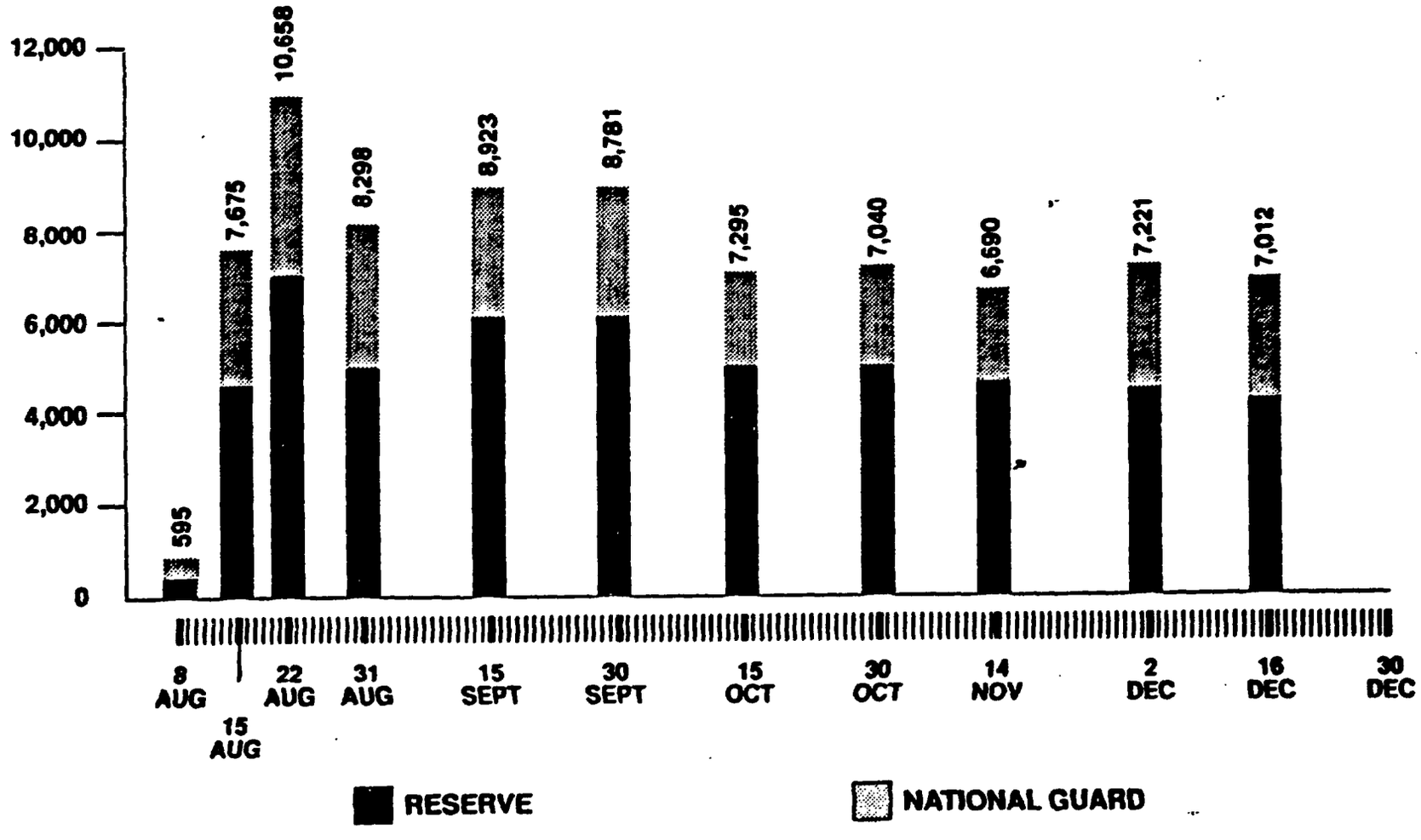


Figure 18

PRESIDENT'S SELECTED RESERVE CALL-UP*

AUTHORIZED/ACTIVATED AS OF 15 JANUARY 1991

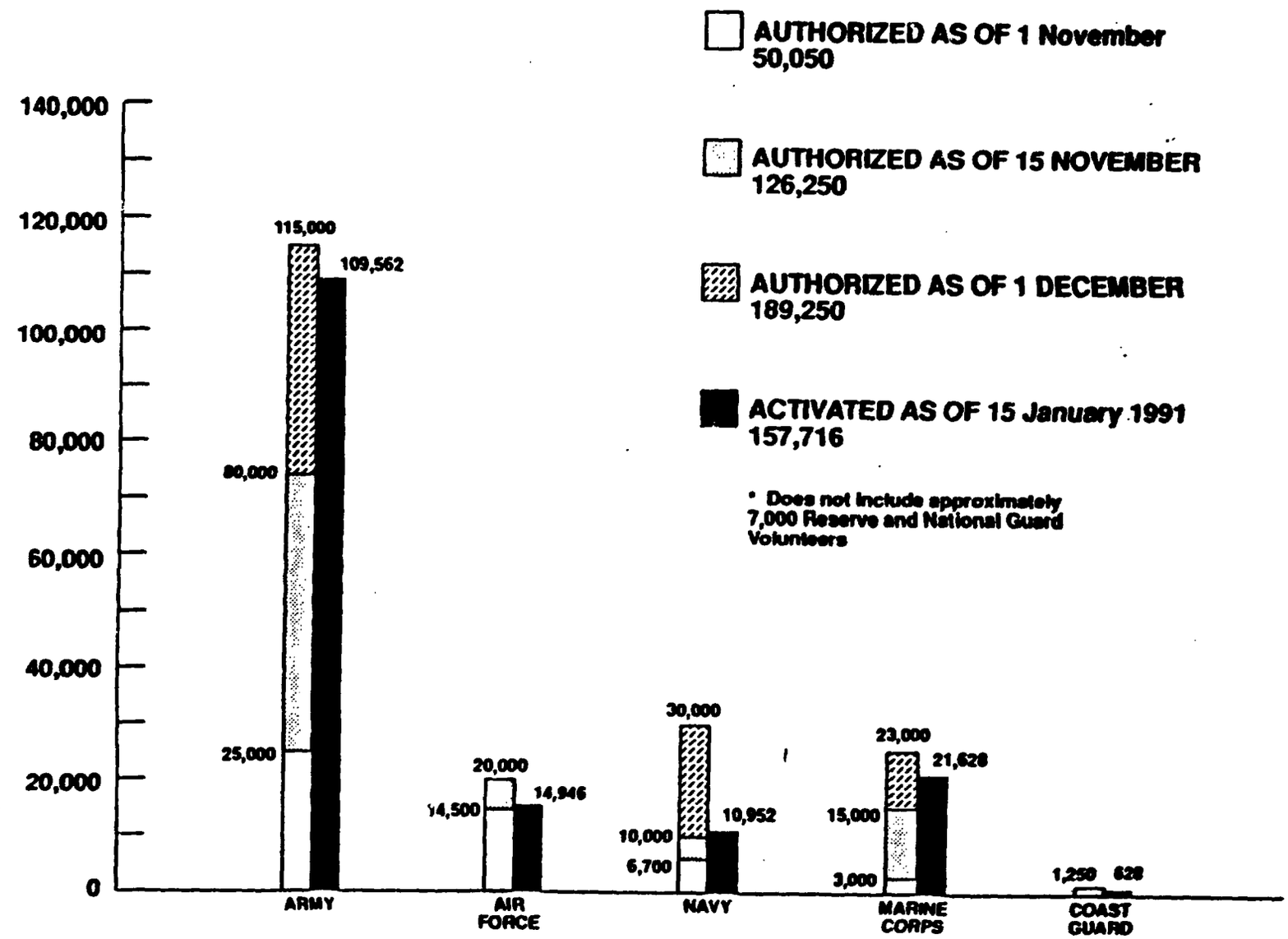
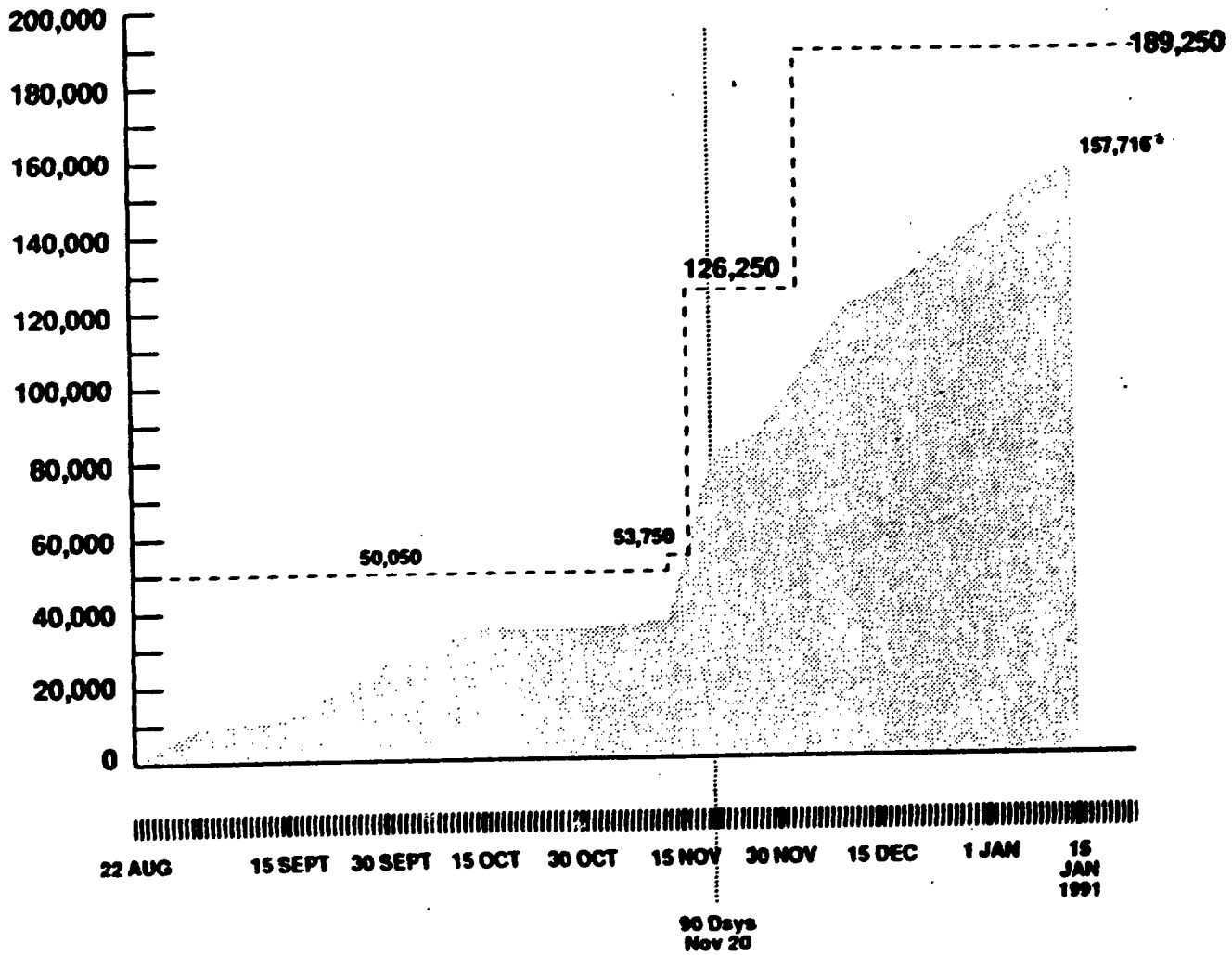


Figure 19

PRESIDENT'S SELECTED RESERVE CALL-UP*

AUTHORIZED/ACTIVATED AS OF 15 JANUARY 1991



* Does not include approximately 7,000 Reserve and National Guard Volunteers

Figure 20

OPERATION DESERT STORM

PRESIDENT'S READY RESERVE CALL-UP*

AUTHORIZED/ACTIVATED AS OF 5 FEBRUARY 1991

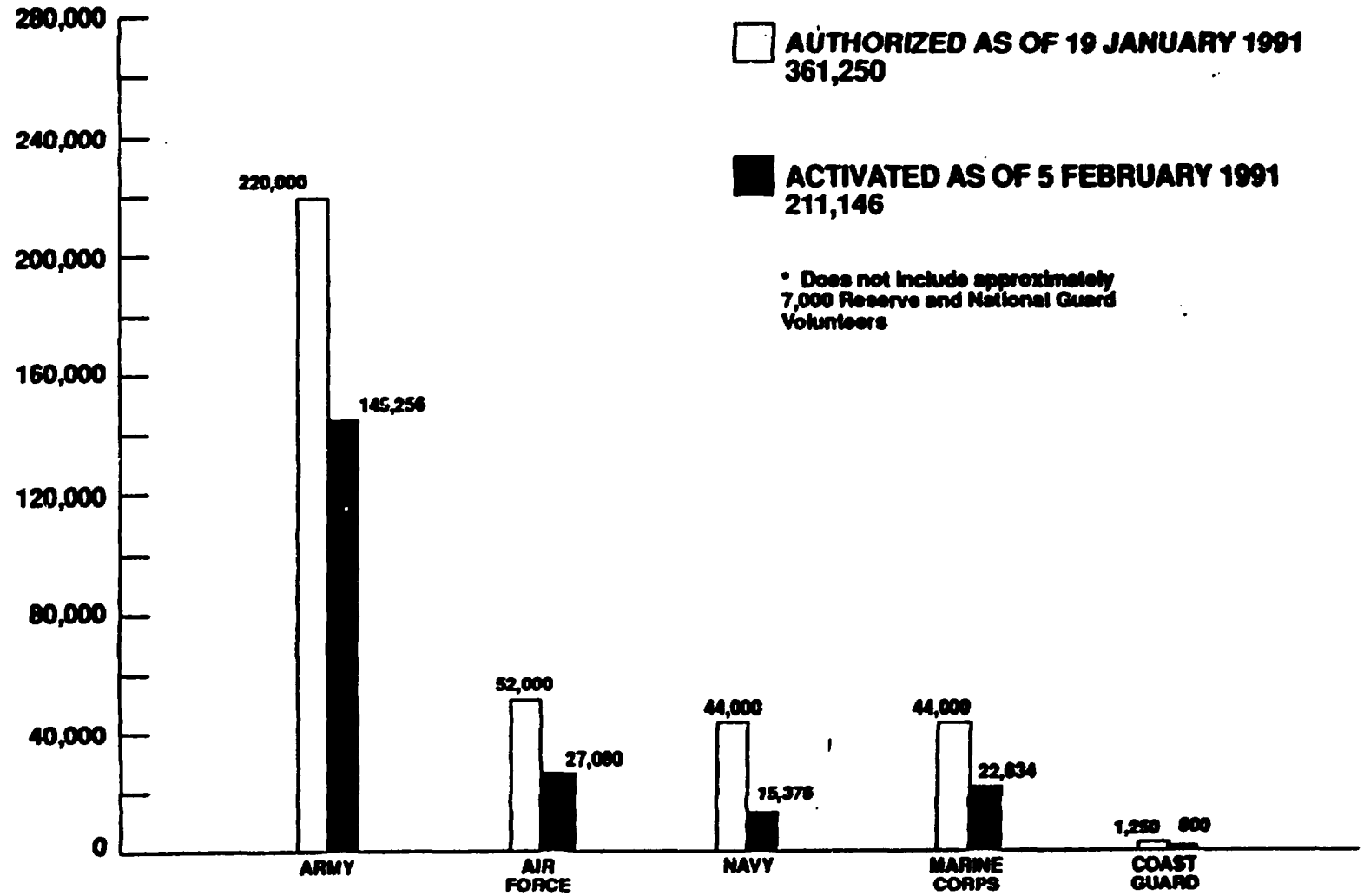


Figure 21

OPERATION DESERT STORM

PRESIDENT'S READY RESERVE CALL-UP*

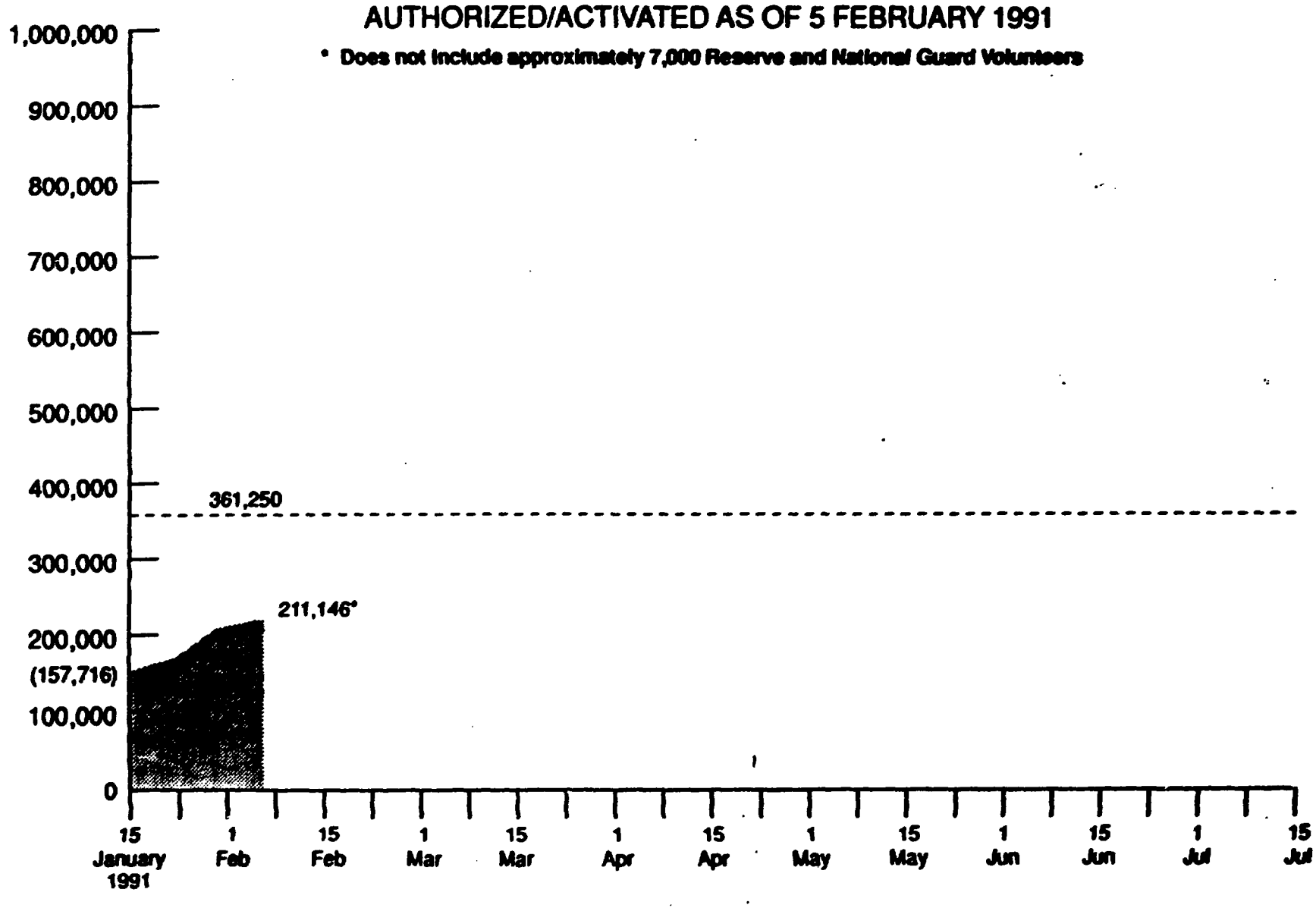


Figure 22

The current share of Guard and Reserve airlift resources are:

RESOURCE	% of TOTAL FORCES
tactical airlift aircraft	59 %
strategic airlift aircraft	14 %
aeromedical evacuation aircrews	93 %
strategic airlift aircrews	50 %
aeromedical airlift aircrews	30 %
aerial ports units	71 %
strategic airlift maintenance personnel	40 %

....Source: Defense 90 Almanac

Obviously, access to these forces is more restricted than active duty organizations. In a large scale operation, their participation is limited to peacetime availability (volunteerism) or wartime activation. Trying to operate between those two extremes is extremely frustrating for everyone: active duty commanders, CINCs, civilian employers, Reservists, and Guardsmen. Fortunately in DESERT SHIELD, the legal recall to active duty came in time to preserve the continuity of airlift forces.

Most reservists expected to be released after the Phase I deployment of defensive forces to Saudi Arabia. However, when the order came to deploy offensive strength to the Persian Gulf region, they settled in for the duration. The Ready Reserve recall on 18 January 1991 and the extension of active duty service to a total of 12 months of involuntary duty occurred one day after the violent commencement of DESERT STORM. After the bullets and bombs started flying, the activated reservists knew they were in for the long haul.

Without such dramatic crisis as DESERT SHIELD/DESERT STORM, the relative availability of Reservists and Guardsmen is normally much less than what we saw in August 1990. Even with widespread public support for a military operation, there is a fuzzy limit on each person's availability. For DESERT SHIELD, it varied by individual but seemed to average about one month. After that, many people had to protect their jobs or businesses.

One important factor in Guard and Reserve participation is the relative degree of public support for a crisis and its proposed military solution. For example, Operation JUST CAUSE was planned and executed in strict secrecy. Air Force Reserve and Air National Guard aircrew schedulers found it difficult to muster any large scale response to short notice calls for participation before anyone knew anything about the planned event.

But on 20 December 1989 when news of the Panama invasion hit CNN News, volunteerism spiked. Before the news broke to stimulate the national interest, however, the aircrew schedulers had considerable difficulty in assembling transport aircrews. "Something big is about to happen - but we can't tell you what it is - can you give us seven days unrestricted availability?" didn't work very well.

In that regard, DESERT SHIELD was perhaps a "best case" example of Guard and Reserve volunteerism in a well-publicized and popular crisis. However, employers will contribute to volunteerism only so long. After that, legal activation is required. And that requires a problem big enough to compel an American president to brave the political uproar that would surely follow - unless there is a popularly supported crisis.

Congress is perfectly content with the political restrictions that Reserve and Guard forces impose on a President - especially a President that prefers to solve foreign policy issues or international politics with gunboat diplomacy. This dependence upon citizen-soldiers, airmen, and sailors not only saves personnel dollars but also serves to restrain ill-conceived military adventures in odd places around the world.

In the aftermath of DESERT SHIELD/DESERT STORM, many Reserve and National Guard commanders are likely to advocate different procedures for the next war. They are sure to seek a voice in the decisionmaking process that decides which units to activate and when - particularly after the initial deployments. The Air Forces Reserves experienced particular frustration in this part of the operation. Some Wing Commanders and Group Commanders were perplexed by the unusual choices of unit activations and by the involuntary activation of individuals from their subordinate units. The timing of some recall actions didn't make sense to them. Some commanders tried to cope with the wartime-induced additional workloads by recommending activation for their subordinate internal support units, only to be rebuffed by higher headquarters or the gaining command. Other commanders had mission ready military forces ready to go to war but they were never used. (Attachment 10)

One of the main problems generated by the Reserve activation process was the decision to activate only parts of wings or groups. In most cases, the Military Airlift Command activated only those functional personnel that directly conducted airlift operations: aircrew flying squadrons, maintenance individuals, and aerial port squadrons. This meant that the additional workload generated by hundreds and sometimes thousands of activated reservists needing administrative support fell onto offices and support organizations that were manned at limited peacetime

levels. The skeleton-sized full-time worker staff did not get any help or additional personnel through activation of their assigned reservists and they were suddenly faced with thousands of aircrew, maintenance and aerial port personnel needing full time attention. Large numbers of activated personnel identified for deployment tried to obtain needed immunizations, identification cards, chemical suits, wills, orders, tools, weapons and other requirements from a support staff configured for peacetime workloads. Volunteerism, civilian overtime and heroic effort saved the war effort in many Reserve and National Guard organizations.

During the early months of DESERT SHIELD, the Military Airlift Command offered active duty mandays to reserve organizations to pay for additional manpower support. However, even that source of funding evaporated by the end of the calendar year. Even after the mobilization of Ready Reserves on 19 January 1991, which raised the personnel limits, MAC continued to restrict administrative support personnel from formal activation and from joining the war effort on a full-time basis.

The decision to activate subordinate elements of units or even individuals without activating the parent wing or group caused considerable hardship and division in many organizations. The Air Force Reserve and Air National Guard wings/groups normally train and function as a unit to accomplish their wartime mission.

Subordinate squadrons and flights within the parent organization perform individual functions, but collectively they form a military organization with external mission capability and internal support and administrative responsibilities. During peacetime, the full-time manning of the support staff/squadrons is based on peacetime workloads. The premise is that the additional workload caused by unit activation would include simultaneous activation of the support staff/squadrons to provide such essential functions as military pay, personnel, medical, and life support.

The worst example of the loss of unit integrity occurred in the associate reserve aircraft maintenance organizations. At stateside MAC bases, several hundred reserve enlisted personnel (without NCO's or Officers) were activated and assigned to active duty maintenance shops to work under the direction, control, and supervision of active duty supervisors. In some shops, a mixture of activated reservists found themselves at the bottom of the pecking order under non-activated Air Reserve Technicians, non-activated reservists, active duty, and straight civilian maintenance employees. This splintering of the reserve maintenance squadrons caused considerable damage throughout those units. Apparently however, unit integrity of associate reserve maintenance squadrons was not important. Their unit morale and their unit effectiveness was sacrificed to provide worker augmentation for active duty aircraft maintenance shops.

The problem with that method of reserve personnel resource management was it's violation of the associate reserve contract and it's disregard of the reserve military organizational integrity. The Military Airlift Command treated the reservists as though they were members of the Individual Ready Reserve (IRR) forces or Individual Mobilization Augmentees (IMAs) and not members of a selected reserve squadron. Military organizations with a Commander, First Sergeant, unit wartime mission, unit emblem, and a unit budget normally loses its identity and its people only upon deactivation - not activation.

The DESERT SHIELD experience provokes institutional questions. When the National Guard and Reserve forces are needed to augment the active forces in time of crisis, who decides which unit will be recalled? What are the selection criteria? When will the activation take place? Is it appropriate for a Guard or Reserve unit to hand over parts of its organization to an active duty gaining command? What are the policies toward unit integrity? Are Reserve and National Guard organizations expected to execute their wartime mission or simply serve as parts bins for active duty organizations?

The nation's first use of the Civil Reserve Air fleet is considered a resounding success by everyone in the airlift business. The Military Airlift Command and the U.S. Transportation Command wished for only one thing - more of them. Even the Department of Transportation is gloating. They are very proud of the high level of volunteerism demonstrated by the carriers and by their enormous boost to the airlift effort. The rapid movement of thousands of combat troops half way around the world is an impressive feat that only the commercial wide-body jumbo jets could do.

The exemplary volunteerism among the carriers set the stage for a supportive role that never wavered. The commercial aircraft always showed where they were supposed to and they delivered outstanding mission reliability. One company tried to continue flying even after Chapter 11 bankruptcy proceedings were filed - that is, until the courts seized their aircraft assets. Overall fleet performance was outstanding: by 20 February 1991, the CRAF had flown 2911 missions in support of DESERT SHIELD.

There were some problems, however. In Aviation Week & Space Technology, Christopher P. Fotos described some labor issues with Pan American Airways and American Airlines and the aircrews. Apparently, not all the carriers had included CRAF provisions in their existing labor contracts. The Airline Pilot's Association

(ALPA) got involved and pressured Pan Am to sign a CRAF agreement with the pilots. The ALPA was concerned about several issues arising from the large numbers of flights to Saudi Arabia under MAC contract. The extra long crew duty days, the extra flight hours per month, and the hazards associated with flying into a war zone were the major complaints from the labor representatives. One ALPA official said he was also interested in getting chemical warfare gear for his pilots flying to Saudi Arabia:

> "Apparently over there, if you must refuel, you're talking 4 to 6 hours on the ground. That's a long time. We said to the company, what are we supposed to do if there's an air raid siren? Are we supposed to chase down the nearest GI and steal his gear?"

At American, the Airline Pilot's Association objected to the company's move to increase the maximum flight hours from 80 hours each month to 85 hours to support CRAF flights for DESERT SHIELD. In addition, the ALPA complained of the excessive crew duty days on the long round trip flights to Saudi Arabia. These complaints arose in spite of the generous CRAF benefits package that American Airlines provided its CRAF-designated flight crews.

In another Aviation Week & Space Technology article, James Ott reported on the recent House hearing which reviewed CRAF performance in Operation DESERT SHIELD. The Air Transport Association and The National Air Carrier Association represented the commercial carriers at the hearings. The association representatives discussed problems and issues associated with the CRAF operations and they recommended:

* "A form of compensation for carriers that provide standby aircraft during a period in which they are awaiting service orders from MAC.

* Improved arrangements for ground servicing of commercial aircraft at military bases and enroute stops, providing for diplomatic clearances and fuel allocations.

* Government reconsideration of improved incentives for airlines to participate in the CRAF program.

* Increased flying hours for military aircraft to alleviate the need for civil transports.

* A government decision to exclude aviation from discussions on the General Agreements on Trade and Services (GATS)."

Several of these issues are certainly valid. The Federal Express aircrew newsletter at attachment 11 collaborates the concerns voiced at the House hearing. However, the need to improve enroute servicing of aircraft existed for both the military and the civil airlift aircraft. Refueling delays affected everyone - not just the commercial carriers. At certain airports in Saudi Arabia where fighters were located, combat aircraft normally got the refueling truck first. At other locations, inadequate resources slowed the throughput of transient aircraft.

Major General Walter Kross - the Director of Operations and Logistics at the U.S. Transportation Command - acknowledged these problems and expressed concern about even more. He also worried about the potential dangers associated with non-combatants transiting a war zone. The Scud rocket attacks with the potential threat of chemical weapons reminded us of the range of modern weapons and of their ability to place support personnel and non-combatants in harms way.

Obviously, limiting exposure would have helped. However, the enroute servicing delays were generic problems, not just a commercial carrier problem. In a similar manner, the air carrier's recommendation to increase flight hours for military airlift completely missed the point. In DESERT SHIELD, the Military Airlift Command ran short of aircrews not flying hours.

The request for compensation while awaiting a MAC cargo load is a business consideration that contract officials should be able to sort out. Perhaps compensation for a delay lasting longer than an agreed upon window would be appropriate. The net result of the arrangement should preserve a healthy business climate for the air carrier. Airlift mission scheduling and support inefficiencies that a C-5 or C-141 aircrew might have to tolerate doesn't make such performance the acceptable standard for everyone else. The commercial carriers operate on extremely thin profit margins. Therefore, problems with mission scheduling and enroute servicing that cause expensive delays make them nervous and impatient.

That situation also explains the air carrier recommendation at the House hearing to improve the incentives associated with CRAF membership. This is an important suggestion for MAC to examine in the aftermath of DESERT SHIELD. Improvements in contractual arrangements and in operational procedures would help recruit additional carriers to join and support the MAC team.

Another problem that surfaced during DESERT SHIELD was the absence of certain aviation materials such as maps, charts, and flight information for the Persian Gulf area for use by the commercial flight crews. Perhaps, MAC could develop fly-away kits to provide the required aviation materials that might be needed when operating into unusual locations or bare base environments.

The kits should be tailored for the environment and the conditions expected in the theater of operations. They could also include sets of the same personnel protective gear and equipment that the military personnel going into the same area would carry. Such obvious considerations would go a long way towards developing an airlift team that has become absolutely critical for our future airlift capability.

The DESERT SHIELD activation and use of the Civil Reserve Air Fleet made airlift history. The commercial carriers clearly demonstrated their effectiveness in long-range strategic airlift, particularly with passengers. Now that we have exercised the system, it is time to review the operation and analyze it for program modernization and improvements. While it is an already excellent arrangement of airlift augmentation in time of national emergency, we must insure that all the problems experienced during DESERT SHIELD get proper attention to preserve this critical airlift resource. As soon as possible after the war, MAC should sponsor a joint conference to review this historical first use of the CRAF and begin the lessons learned process.

The obvious shortfall in DESERT SHIELD airlift was C-5 strategic aircrews. The aircrew manning ratio of 3.02 provided insufficient numbers of qualified crews to stay up with the surge utilization rate of the airplane. As a result, MAC officials extended the following aircrew work rules to stretch available manpower resources:

> basic crew duty day from 16 to 20 hours.

> 30-day flying time from 125 hours to 150 hours.

> augmented crew duty day from 24 to 26 hours.

In addition, MAC pre-positioned extra pilots at the primary crew stage locations in Europe to provide augmentation for the round trip to Saudi Arabia. This procedure proved to be an excellent measure to extend pilot resources for the excessively long crew duty days. However, the use of pool pilots did not alleviate the aircrew ratio problem and accumulated flying time limitations.

If future wartime aircraft utilization is expected to increase into the 12 plus hours per airplane per day range again, then an effective aircrew ratio of at least four to one is absolutely necessary. The commercial carriers realized and accepted these aircrew ratios in intercontinental operations long ago. They pay the market rate for commercial airline pilots to operate at the four crews per airplane ratio - because it is safer and more efficient.

The reduction of aircrew ratios below four to one limits MAC surge capability and sustainability. The practice of paying for a three to one crew ratio and then trying to stretch it to four to one is dangerous and risky business. It also limits endurance. Running on adrenalin and leaning forward in the straps can work short term miracles but lacks staying power and induces aircrew burnout. Symptoms of this burnout include aircraft incidents and accidents and an eventual grinding down of the airlift machine.

The cost of airplane losses and the aftermath of aircrew fatalities would completely offset any perceived benefit from an underfunded aircrew compliment. The obvious difficulty lies in the measurement of human factors that relate to safe operation of aircraft. What are the limits to pilot endurance? How do you know when you get there? If 150 hours in 30 days is okay, what about 200? Is 330 hours in 90 days a hard limit? What about 400 hours in 90 days? If you are managing thousands of pilots, how do you know when to slow down?

The other relevant factor in the aircrew shortfall is the actual difference between positions authorized in a flying squadron and the number of current and mission-qualified crewmembers actually assigned against those authorized positions. The aircrew ratio referenced by the Air Staff is based on <u>positions authorized</u> - not actual combat mission readiness as measured by airplane qualification numbers.

What were the mission readiness ratings in the C-5 and C-141 flying squadrons when DESERT SHIELD started? Certainly not 100 percent. Mission readiness reporting is normally a percentage derived by dividing the number of mission-qualified crewmembers by the number of positions authorized. In the real world, 100 percent manning with current and mission-qualified pilots, flight engineers, and loadmasters has probably never been attained or sustained in any squadron.

A percentage of low to high nineties is a much more normal report for a typical strategic airlift flying squadron to submit each month. Sometimes, recruiting problems or turnover rates can reduce the mission readiness ratings below 85 percent in certain crew positions. The challenge to recruit and fill all authorized slots in a Guard or Reserve squadron and then to keep a current and mission qualified pilot, engineer or loadmaster in each position is a continual, never-ending struggle in all volunteer flying squadrons.

If this is the case, then we entered the war with even less than 3.02 crews per C-5 and 3.92 crews per C-141. It is no wonder that C-5 crewmembers quickly and then frequently hit the extended 30-day maximum flying time limit of 150 hours. It is also no wonder that many crewmembers hit the 330 hour stop by early as January 1991. What price did we pay for that stretch in human resources? What price will we pay?

One symptom of the accumulated aircrew stress and fatigue was - predictably - typical GI complaints about their misfortunes. Operations Officers and flying squadron Commanders heard many hours of complaints and bellyaching from their aircrews who were flying continuously in DESERT SHIELD. The stress and fatigue reduced their resilience, their patience, and their tolerance of the "Fog of War." They complained of several problems in the airlift pipeline but seemed to concentrate on one they called aircrew stage management. The feedback from many C-5 and C-141 aircrews flying in DESERT SHIELD included their intense frustration and anger with perceived inefficient or inequitable decisions in the conduct of enroute stage management. Many Squadron and Wing Commanders flew on airlift missions and witnessed some of these aircrew problems first hand.

Aircrew stage management is the delicate process of providing rested airlift crews - on demand - at intermediate or turnaround locations. In DESERT SHIELD, the aircrew stages operated mainly at Rhein Main Air Base, Germany, Ramstein Air Base, Germany, and Torrejon Air Base, Spain. As airlift missions transited these locations, the aircraft normally spent only a few hours on the ground for servicing, minor maintenance actions, and cargo manipulation. An outbound replacement crew would replace the arriving crew and the mission would proceed to the next stage point or the AOR for turnaround. The inbound crew that was relieved would contact the MAC command and control agency and

the aircrew stage manager for release from duties and assignment of their "legal-for-alert time," normally about twelve hours later.

At each stage location, the number of aircrews varied from 20 to 30 at any given time, depending on mission flow rates. An aircrew stage manager supervised the aircrew schedules for rest and mission alerting. It was the stage manager's job to insure available aircrews for any combination of higher headquarters mission tasking.

After resting and at the crew's "legal for alert time," any number of things happened. One was a normal alert, aircraft preflight, and mission continuation. Other possibilities included delays due to aircraft maintenance or bad weather. Sometimes, the command and control authority didn't need a crew at that particular time.

If there was some kind of delay, the DESERT SHIELD procedure was to standby the telephone for up to twelve hours in a ready and available manner until released or alerted for a mission. The main problem was the lack of timely and accurate information about mission and aircraft status or location. Unfortunately, the resulting guesswork or overly conservative aircrew management seemed to seriously irritate the tired and frustrated aircrews.

And there were many more variations than the simple ones described. Unusual conditions prevailed and good information was scarce. Dominating everything was the urgency of DESERT SHIELD. The "Fog of War" got thick at times and, as always, the MAC system depended on its aircrews to pull all the loose ends together and move the mission in a safe and timely manner. The airlift system depended upon the aircrews to solve problems creatively and purposefully. And they did that in spite of their fatigue and their frustration with perceived problems in the system.

Aircrew stage management is a core part of MAC Command and Control that needs attention. It is a dynamic flow process that could be developed into a reasonably efficient mechanism to provide aircrews upon demand. Industrial engineers have been doing similar work for many years. Computers and computer software programs are available to accomplish the necessary information processing and data retrieval. Professional training for dedicated officer aircrew stage managers in this type of dynamic resource management would also make an enormous difference in the quality, timeliness, and effectiveness of decisions.

Unfortunately, the enroute crew stage manager in DESERT SHIELD was normally a pilot or navigator who deployed TDY to the stage location for a short period of time. This poor soul had to learn a sophisticated management process -

starting from scratch - inside a crisis environment. The stage managers at Rhein Main, Ramstein, and Torrejon had to teach themselves how to survive the pressures of the situation and how to guarantee available aircrews at all costs. Normally, the working environment consisted of a back room, a table, a yellow pad of paper, and a telephone.

Perhaps a more organized approach could help the critical task of enroute stage management. If the shortage of aircrews is going to continue, efficient use of the available crews is absolutely necessary. In future airlift operations, the C-17 aircraft will probably be operating at higher throughput pace, requiring even more available aircrews to stay abreast of the aircraft. (See attachment 12.)

MAC should consider the development of a deployable package to provide enroute airlift support in a mini-command post type operation that included trained stage managers and command post type controllers. The enroute stage management package should also contain desktop computers and appropriate software to accomplish information processing and data manipulation tasks to assist the decision process. More importantly, portable communications terminals, telephones, and computers must be available for the stage managers to connect to the MAC command and control system. Waiting for airplanes to appear over the horizon is reactive and inefficient management.

In spite of the difficulties, DESERT SHIELD made airlift history. The combined effort of Active Duty personnel, Reservists, National Guardsmen, and commercial CRAF aircrews made the DESERT SHIELD airlift a record-breaking accomplishment that is likely to stand for a long time. The large scale activation of Guard and Reserve forces and the activation of the Civil Reserve Air Fleet worked surprisingly well in spite of some problems encountered. Now, the aftermath of DESERT SHIELD and DESERT STORM - including redeployment operations and deactivation - must include a careful analysis of "lessons learned."

The conduct of that examination must include the active participation of National Guard and Reserve leadership, commercial air carriers, and gaining command personnel. While it might be tempting for the gaining command to dictate policy during the deliberations, it should be remembered that CRAF, National Guard, and Reserve membership is strictly voluntary. Pretending that problems didn't exist or attacking the messenger misses the point. It also guarantees repetition of similar mistakes in the next contingency airlift.

According to Brigadier General Christman's article in Armed Forces Journal International, the new world order and the new DOD budget dictates a new strategy in national security. The reduction in forward military deployments and the overall downsizing of available military forces kicks into motion two guiding

principles: flexibility and mobility. General Christman warned that "strategic lift - in spite of the outstanding performance by the U.S. Transportation Command in executing the Herculean requirements imposed by the 8,000 mile distance to the Persian Gulf - must still be rationalized with the mobility requirements imposed by the new strategy. Moving a credible force to an area at the outset of a crisis, when stability is threatened, is key to strategic success."

Only MAC airlift can provide the rapid, long range mobility required in that strategic lift situation. DESERT SHIELD provided an excellent test of the team's effectiveness in one of the most demanding circumstances possible. Now we need to review the tapes and fine tune the airlift system to even greater levels of productivity and efficiency.

As David Morrison stated in his article in the National Journal:

> "According to a military adage, amateurs talk strategy; professionals talk logistics. And more than anything else, DESERT SHIELD thus far has been a stunning exercise of U.S. supply capabilities. In some regards, it is the most taxing such operation since World War II, maybe even in American history."

Sources Cited

Bond, David F., "C-141s Fly Middle East Missions Despite Weight, Operating Curbs," Aviation Week & Space Technology, 27 August 1990, pages 21-22.

Bond, David F., "Desert Shield Airlift Slackens as Mission Shifts to Support," Aviation Week & Space Technology, 8 October 1990, page 76.

Christman, Brigadier General Daniel W., "Desert Shield: Test of a New 'Contingency' Strategy, Armed Forces Journal International, December 1990, Page 50.

Cole, Brigadier General James L. Jr., Personal Interview at Headquarters Military Airlift Command, Scott Air Force Base, Illinois, 4 February 1991.

Defense 90 Almanac, Armed Forces Information Service, Alexandria, Virginia, November/December 1990, page 18.

Fotos, Christopher P., "Pan Am, American Pilots at Odds With Management Over CRAF Programs," Aviation Week & Space Technology, 10 September 1990, page 69.

Fulghum, David A., "Reserve Pilots Say Call-up Mishandled for Desert Shield," Aviation Week & Space Technology, Number 24, Volume 133, 10 December 1990, pages 81-82.

Garner, David, "Operation Desert Shield/Desert Storm" Briefing, Logistics Management Institute, Bethesda, Maryland, 21 February 1991.

Sources Cited

Johnson, General Hansford T., Speech given to the St. Clair County Korean War Veterans, Belleville, Illinois, 26 January 1991.

Johnson, General Hansford T., Speech given to the 112th National Guard Association of the United States General Conference at Reno, Nevada on 2 October 1990.

Kross, Major General Walter, Personal Interview at Headquarters U.S. Transportation Command at Scott Air Force Base, Illinois on 4 February 1991.

Morrison, David C., "Baptism by Fire," National Journal, Number 39, 29 September 1990, pages 2318-2323.

Ott, James, "U.S. Carriers Want Changes in Military Airlift Program," Aviation Week & Space Technology, 15 October 1990, page 31.

"Twelve Reserve Squadrons Activated to Help MAC with Saudi Airlift," Aviation Week & Space Technology, 3 September 1990, page 36.

"USAF Investigators Say Inadvertent Thrust Reversal Caused C-5 Crash," Aviation Week & Space Technology, Number 25, Volume 133, 17 December 1990, page 69.

Attachments

1. DESERT SHIELD Deployment Spreadsheet: Missions, Passengers, and Cargo Payloads Plus Cumulative Totals.

2. Aircrew Operations Handout for Operation DESERT SHIELD.

3. Flight Crew Information Files from Dover AFB, Delaware.

4. "Initiatives Taken by MAC to Obtain Civil Airlift in Operation DESERT SHIELD"

5. Notification Messages implementing 200K Reserve Call-up.

6. Activation of Ready Reserve Units.

7. Air Force Reserve Activation Statistics.

8. Air National Guard Activation Statistics.

9. HQ MAC/CAT-D message: Waiver for Strategic Airlift Operations (extends crew duty day to 26 hours)

10. House Armed Services Committee News Release

11. Federal Express Air Operations Aircrew Newsletter

12. The C-17 in DESERT SHIELD/DESERT STORM.