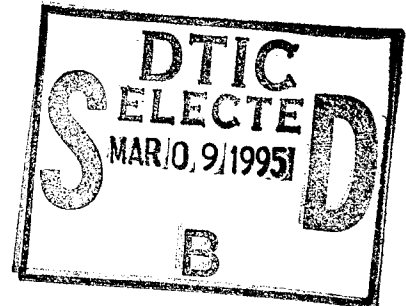




**Military Flying
and Aeromedical Evaluation
of Cardiac Arrhythmias**

By

Kevin T. Mason



Aircrew Protection Division

December 1994

19950306 020

Approved for public release; distribution unlimited.

**United States Army Aeromedical Research Laboratory
Fort Rucker, Alabama 36362-0577**

Notice

Qualified requesters

Qualified requesters may obtain copies from the Defense Technical Information Center (DTIC), Cameron Station, Alexandria, Virginia 22314. Orders will be expedited if placed through the librarian or other person designated to request documents from DTIC.

Change of address

Organizations receiving reports from the U.S. Army Aeromedical Research Laboratory on automatic mailing lists should confirm correct address when corresponding about laboratory reports.

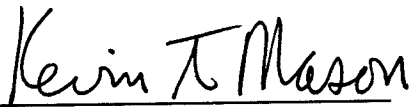
Disposition

Destroy this document when it is no longer needed. Do not return it to the originator.

Disclaimer

The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other official documentation. Citation of trade names in this report does not constitute an official Department of the Army endorsement or approval of the use of such commercial items.

Reviewed:

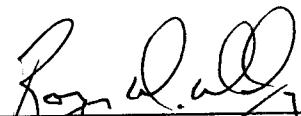


KEVIN T. MASON
LTC, MC, MFS
Director, Aircrew Protection
Division

Released for publication:



DENNIS F. SHANAHAN
Colonel, MC, MFS
Commanding



ROGER W. WILEY, O.D., Ph.D.
Chairman, Scientific
Review Committee

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188		
1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS			
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release, distribution unlimited				
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE						
4. PERFORMING ORGANIZATION REPORT NUMBER(S) USAARL Report No. 95-7			5. MONITORING ORGANIZATION REPORT NUMBER(S)			
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Aeromedical Research Laboratory		6b. OFFICE SYMBOL (If applicable) MCMR-UAD	7a. NAME OF MONITORING ORGANIZATION U.S. Army Medical Research and Materiel Command			
6c. ADDRESS (City, State, and ZIP Code) P.O. Box 620577 Fort Rucker, AL 36362-0577			7b. ADDRESS (City, State, and ZIP Code) Fort Detrick Frederick, MD 21702-5012			
8a. NAME OF FUNDING/SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER			
8c. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS			
			PROGRAM ELEMENT NO. 62787A	PROJECT NO. 30162787A878	TASK NO. HC	WORK UNIT ACCESSION NO. 144
11. TITLE (Include Security Classification) Military flying and aeromedical evaluation of cardiac arrhythmias						
12. PERSONAL AUTHOR(S) Kevin T. Mason						
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 1994 December		15. PAGE COUNT 8	
16. SUPPLEMENTARY NOTATION						
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)			
FIELD	GROUP	SUB-GROUP	Army aviation personnel, arrhythmia			
06	05					
05	09					
19. ABSTRACT (Continue on reverse if necessary and identify by block number)						
<p>The evaluation and management of cardiac arrhythmias in military aircrew members are complex, and perhaps, more aggressive than clinical cardiologists, internists, and family physicians expect. However, these policies are based on the needs of the services, mission completion requirements, public safety, and an extensive, ongoing, observational epidemiology research program of the military flying population.</p> <p>This paper summarizes the general considerations of the flying environment as they relate to cardiac arrhythmias. A discussion of the screening principles and epidemiologic confounders is followed by a summary of the joint U.S. Air Force and U.S. Army waiver policy on cardiac arrhythmias and flying duties.</p>						
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified			
22a. NAME OF RESPONSIBLE INDIVIDUAL Chief, Science Support Center			22b. TELEPHONE (Include Area Code) (205) 255-6907	22c. OFFICE SYMBOL MCMR-UAX-SI		

Table of contents

	Page
The military flying environment	3
Military relevance	3
General considerations	3
High performance, fixed-wing missions	4
Low performance, fixed-wing missions	4
Rotary-wing missions	4
U.S. Air Force and U.S. Army waiver policy on arrhythmias and flying duties	4
Screening method	4
Bradyarrhythmias	5
Unifocal or multifocal premature contractions	5
Ventricular tachycardia	6
Supraventricular tachycardia	6
Wolff-Parkinson-White pattern and syndrome	6
Conduction dysfunction	6
Summary	7
Bibliography	8

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/_____	
Availability Codes	
Dist	Avail and/or Special
A-1	

This page left blank intentionally

The military flying environment

Military relevance

The American Heart Association (AHA) called a scientific conference on personal and public safety issues related to arrhythmias that may impair consciousness. AHA's goal is to develop a task force consensus for publication. AHA tasked the author to state the U.S. Army's aeromedical evaluation of cardiac arrhythmias as it relates to military flying.

General considerations

U.S. military aircrew members fly public use aircraft, rather than private or commercial aircraft. In case of military aircraft mishap, military services carry the full burden of liability for life, as well as private and public property. The public has a high expectation that the military will protect them, while conserving the public's investment in aircrew training and aviation assets. They do not expect military aircraft with hazardous materials to crash into their homes, schools, and businesses.

The U.S. Army (USA) and U.S. Air Force (USAF) own and operate public use aircraft. By federal law, the agency that owns and operates public use aircraft is responsible for the medical certification of agency aircrew members, rather than the Federal Aviation Administration (FAA). So the USA and USAF conduct a physical evaluation program for aircrew members for medical certification of aircrew members. Arrhythmias and other cardiovascular disease risk factors commonly are found during these examinations. Since cardiac arrhythmias may be accompanied by acute incapacitation, increasing the risk for mishap, the USA and USAF have a joint policy on removing aircrew members with high risk cardiac conditions from flying duties.

The joint USA and USAF arrhythmia policy of limiting military flying duties also is based on other concerns. Military services expect their aircrew members to be combat ready and deployable worldwide. On short notice, military aircrew members might operate in isolated situations, or Third World countries with limited medical care facilities. They may eat irregularly, exercise heavily, be subject to circadian desynchronosis and shiftlag, suffer from fatigue, and endure environmental extremes, to include hypoxia and acceleration forces. In these adverse circumstances, military services cannot support the use of antiarrhythmic medications, provide specialized care for cardiac pacers, or treat emergency arrhythmias.

Complicating the matter is these stressful circumstances may produce arrhythmias even in normal individuals. The prognostic significance and risk for incapacitation due to arrhythmias induced by exogenous factors in the military operational environment are unknown.

High performance, fixed-wing missions

Fighter pilots fly in a high performance, fixed-wing mission flying environment. Often flying alone at night or in adverse weather, the pilot is exposed to high acceleration forces and hypoxia at the limits of human tolerance. This environment induces what are likely benign arrhythmias. However, aircrew members with undetected cardiac disease are at increased risk for acute incapacitation due to pathologic arrhythmias. If a pilot suffers acute incapacitation, that pilot usually has no automatic aircraft recovery systems to prevent mishaps.

Low performance, fixed-wing missions

Transport and bomber aircrews fly low performance, fixed-wing missions. In the past, most of these missions outside war zones were not much different from commercial flying with pressurized cabins, environmental control, and automated flight controls. Some fly in near-space conditions in pressurized space suits. The USAF has developed low-level night missions using night vision devices, increasing the complexity of the cockpit environment.

Rotary-wing missions

Rotary-wing pilots fly aggressively near the tree tops, dodging electric wires and towers. Often, they are flying at night using night vision devices. Pilots must remain constantly on the rotary-wing aircraft flight controls without automatic pilot. Cabins usually lack environmental control. Pilots are exposed to whole-body vibrations. Newer rotary-wing aircraft can generate hemodynamically significant acceleration forces. Hypoxia usually is not encountered.

U.S. Air Force and U.S. Army waiver policy on arrhythmias and flying duties

Screening method

The goal of cardiovascular disease screening for USA and USAF aircrew members is to detect subclinical disease and remove the aircrew member from flying duties before symptoms occur. Regarding cardiovascular disease, we deal more often with abnormal tests than clinical symptoms. The dilemma is that most medical studies focus on the management of clinical diseases, rather than on developing risk assessments for abnormal tests found in otherwise asymptomatic individuals.

Since the 1960s, the USA and USAF used observational epidemiology methods to develop their joint policies on the management of cardiac arrhythmias in their aircrew members. The USA and USAF used screening and evaluation protocols, health and safety databases, and followup groups for selected conditions to derive analyses from prospective and retrospective studies.

A major confounder to the study analyses is that military aircrew members are not representative of the general population. They are primarily Caucasian males. They excel in both athletics and scholastics. Most are survivors of a rigorous selection process that included 4 years of military academy or reserve officer (ROTC) training, challenging the mind and body. They must pass several medical examinations. The sick and weak-hearted are not allowed to enter flight training.

Bradyarrhythmias

Sinus bradycardia is a common finding in the physically fit, military aircrew population. Those with heart rates ≤ 40 beats per minute are referred for noninvasive evaluation. Selected aircrew members undergo electrophysiologic study. Aircrew members with normal response to exercise and no evidence of sinus node dysfunction are returned to flying duties. Those with sinus node dysfunction, including those using cardiac pacing, are restricted from flying duties.

Aircrew members with sinus pauses undergo Holter monitoring and graded exercise treadmill test. Those with brief, asymptomatic, and infrequent pauses, less than 4 seconds duration, are returned to flying duties. Selected aircrew members are referred for electrophysiologic studies. Those with symptoms or sinus node dysfunction are restricted from flying duties.

Unifocal or multifocal premature contractions

Aircrew members with premature atrial contractions undergo a noninvasive evaluation to include Holter monitor, and if indicated, echocardiogram and graded exercise treadmill test. If present, aggravating factors such as thyroid disease, nicotine and caffeine abuse, and alcohol abuse are treated before making a final disposition. Aircrew members with benign findings are returned to unrestricted flying duties, while those with underlying heart disease or other associated extracardiac abnormalities are returned to flying duties on a case-by-case basis.

Aircrew members with premature ventricular contractions (PVCs) undergo a noninvasive evaluation to include Holter monitor. If more than 10 percent of beats are PVCs, the aircrew member undergoes additional testing to include graded exercise treadmill test, echocardiogram, and cardiac fluoroscopy (to rule out cardiac calcifications). Those at risk for coronary artery disease may undergo coronary angiography, if indicated. Aircrew members with infrequent PVCs and no evidence of cardiac disease are returned to flying duties. Those with underlying heart disease or other extracardiac abnormalities are returned to flying duties on a case-by-case basis.

Ventricular tachycardia

Aircrew members with 3 or more ventricular beats in a row at a rate ≥ 100 beats per minute are restricted from flying duties pending further evaluation. Those with a single run of ventricular tachycardia (VT) are returned to low performance flying duties if they have three normal Holter monitors over 3 months, normal echocardiogram, normal exercise treadmill test, and no evidence of organic heart disease. Selected aircrew members, primarily those age 36 or older, also undergo coronary angiography. Those with recurrent VT, or a single episode of VT complicated by any degree of coronary artery occlusion or other cardiac conditions, are restricted from flying duties.

Supraventricular tachycardia

Aircrew members with three or more supraventricular beats in a row are restricted from flying duties pending further evaluation. Those with only a single run of 3 to 10 beats of supraventricular tachycardia (SVT) are returned to flying duties if they have three normal Holter monitors over 3 months, normal thyroid function tests, and normal echocardiogram and exercise treadmill test. Those with greater than 10 beats of SVT or recurrent SVT undergo a tertiary aeromedical cardiology consultation, which may include cardiac catheterization with coronary angiography and/or electrophysiologic studies. Selected individuals are returned to flying duties, but those with other conditions, such as ventricular tachycardia, early aortic insufficiency, and minimal coronary artery disease, may be restricted to low performance aircraft only. Aircrew members with SVT and significant coronary artery disease, SVT and Wolff-Parkinson-White pattern, hemodynamically unstable SVT, or recurrent sustained SVT are not returned to flying duties.

Wolff-Parkinson-White pattern and syndrome

Aircrew members with Wolff-Parkinson-White (WPW) pattern may return to flying duties if a noninvasive cardiovascular evaluation is normal. Aircrew members with WPW syndrome are restricted from flying duties. Selected aircrew members with WPW syndrome may return to flying duties following complete recovery from radiofrequency ablation of their bypass tract. They must have multiple normal Holter monitor tracings over 6 months. Then, a repeat electrophysiologic study must show no missed or concealed bypass tracts and propensity for ventricular arrhythmias.

Conduction dysfunction

Aircrew members with first degree AV block with normalization during exercise are returned to flying duty. Mobitz Type I AV block is a normal variant finding in military aircrew members and does not result in flying duty restriction. Those with Mobitz Type II AV block or third degree AV block, with or without cardiac pacing, are restricted from flying duties.

Aircrew members with congenital right bundle branch block (RBBB) and normal echocardiograms are allowed to enter flight training. Those with acquired RBBB are returned to flying duties if they have a normal noninvasive evaluation, to include graded exercise treadmill test, echocardiogram, and Holter monitor.

Aircrew members with left bundle branch block are restricted from flying duties pending further evaluation. They are referred for tertiary aeromedical cardiology consultation. Those with normal noninvasive evaluations, and normal cardiac catheterization studies to include coronary angiography and electrophysiologic studies, are returned to flying duties. Those with other cardiac findings, such as coronary artery occlusions, valvular heart disease, prolonged HIS-ventricular interval, cardiomyopathy, etc., are restricted from flying duties.

Summary

The evaluation and management of cardiac arrhythmias in military aircrew members are complex, and perhaps, more aggressive than clinical cardiologists, internists, and family physicians expect. However, these policies are based on the needs of the services, mission completion requirements, public safety, and an extensive, ongoing, observational epidemiology research program for our population.

Bibliography

- Canaveris, G., Halpern, M. S., and Elizari, M. V. 1992. Intraventricular conduction disturbances in civilian flying personnel: left anterior hemiblock. Aviation, space and environmental medicine. 63:292-298.
- Celio, P. V. 1993. Aeromedical disposition of arrhythmias and electrocardiographic findings in aircrew. Cardiopulmonary aspects of aerospace medicine. Neuilly-sur-Seine, France: Advisory Group for Aerospace Research and Development. AGARD-LS-189. pages 5-1 to 5-9.
- Gordon, R. S., O'Dell, K. B., Low, R. B., and Blumen, I. J. 1990. Activity-sensing permanent internal pacemaker dysfunction during helicopter aeromedical transportation. Annual of emergency medicine. 19:1260-1263.
- Kruyer, W. B. 1987. Aeromedical evaluation and disposition of electrocardiographic abnormalities. Short course on cardiopulmonary aspects of aerospace medicine. Neuilly-sur-Seine, France: Advisory Group for Aerospace Research and Development. AGARD-R-758. pages 1-1 to 1-8.
- Kruyer, W. B. 1993. Screening for asymptomatic coronary heart disease. Cardiopulmonary aspects of aerospace medicine. Neuilly-sur-Seine, France: Advisory Group for Aerospace Research and Development. AGARD-LS-189. pages 2-1 to 2-5.
- Mason, K. T. 1990. U.S. Army aeromedical policy letter 2-90, electrocardiographic findings. Fort Rucker, AL: U.S. Army Aeromedical Center. APL 2-90.
- McCormick, T. J., and Lyons, T. J. 1991. Medical causes of in-flight incapacitation: USAF experience 1978-1987. Aviation, space and environmental medicine. 62:884-887.
- Tachibana, S., Akamatsu, T., Nakamura, A., and Yagura, S. 1994. Serious arrhythmia coinciding with alteration of consciousness in aircrew during +G_z stress. Aviation, space and environmental medicine. 65:60-66.
- Whinnery, J. E. 1990. The electrocardiographic response to high +G_z centrifuge training. Aviation, space and environmental medicine. 61:716-721.
- Whinnery, J. E., and Hickman, J. R. 1988. Acceleration tolerance of asymptomatic aircrew with mitral valve prolapse and significant +G_z-induced ventricular dysrhythmias. Aviation, space and environmental medicine. 59:711-717.

Initial distribution

Commander, U.S. Army Natick Research,
Development and Engineering Center
ATTN: SATNC-MIL (Documents
Librarian)
Natick, MA 01760-5040

Chairman
National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, DC 20594

Commander
10th Medical Laboratory
ATTN: Audiologist
APO New York 09180

Naval Air Development Center
Technical Information Division
Technical Support Detachment
Warminster, PA 18974

Commanding Officer, Naval Medical
Research and Development Command
National Naval Medical Center
Bethesda, MD 20814-5044

Deputy Director, Defense Research
and Engineering
ATTN: Military Assistant
for Medical and Life Sciences
Washington, DC 20301-3080

Commander, U.S. Army Research
Institute of Environmental Medicine
Natick, MA 01760

Library
Naval Submarine Medical Research Lab
Box 900, Naval Sub Base
Groton, CT 06349-5900

Executive Director, U.S. Army Human
Research and Engineering Directorate
ATTN: Technical Library
Aberdeen Proving Ground, MD 21005

Commander
Man-Machine Integration System
Code 602
Naval Air Development Center
Warminster, PA 18974

Commander
Naval Air Development Center
ATTN: Code 602-B
Warminster, PA 18974

Commanding Officer
Armstrong Laboratory
Wright-Patterson
Air Force Base, OH 45433-6573

Director
Army Audiology and Speech Center
Walter Reed Army Medical Center
Washington, DC 20307-5001

Commander/Director
U.S. Army Combat Surveillance
and Target Acquisition Lab
ATTN: SFAE-IEW-JS
Fort Monmouth, NJ 07703-5305

Director
Federal Aviation Administration
FAA Technical Center
Atlantic City, NJ 08405

Director
Walter Reed Army Institute of Research
Washington, DC 20307-5100

Commander, U.S. Army Test
and Evaluation Command
Directorate for Test and Evaluation
ATTN: AMSTE-TA-M (Human Factors
Group)
Aberdeen Proving Ground,
MD 21005-5055

Naval Air Systems Command
Technical Air Library 950D
Room 278, Jefferson Plaza II
Department of the Navy
Washington, DC 20361

Director
U.S. Army Ballistic
Research Laboratory
ATTN: DRXBR-OD-ST Tech Reports
Aberdeen Proving Ground, MD 21005

Commander
U.S. Army Medical Research
Institute of Chemical Defense
ATTN: SGRD-UV-AO
Aberdeen Proving Ground,
MD 21010-5425

Commander
USAMRMC
ATTN: SGRD-RMS
Fort Detrick, Frederick, MD 21702-5012

HQ DA (DASG-PSP-O)
5109 Leesburg Pike
Falls Church, VA 22041-3258

Harry Diamond Laboratories
ATTN: Technical Information Branch
2800 Powder Mill Road
Adelphi, MD 20783-1197

U.S. Army Materiel Systems
Analysis Agency
ATTN: AMXSY-PA (Reports Processing)
Aberdeen Proving Ground
MD 21005-5071

U.S. Army Ordnance Center
and School Library
Simpson Hall, Building 3071
Aberdeen Proving Ground, MD 21005

U.S. Army Environmental
Hygiene Agency
ATTN: HSHB-MO-A
Aberdeen Proving Ground, MD 21010

Technical Library Chemical Research
and Development Center
Aberdeen Proving Ground, MD
21010-5423

Commander
U.S. Army Medical Research
Institute of Infectious Disease
ATTN: SGRD-UIZ-C
Fort Detrick, Frederick, MD 21702

Director, Biological
Sciences Division
Office of Naval Research
600 North Quincy Street
Arlington, VA 22217

Commandant
U.S. Army Aviation
Logistics School ATTN: ATSQ-TDN
Fort Eustis, VA 23604

Headquarters (ATMD)
U.S. Army Training
and Doctrine Command
ATTN: ATBO-M
Fort Monroe, VA 23651

IAF Liaison Officer for Safety
USAF Safety Agency/SEFF
9750 Avenue G, SE
Kirtland Air Force Base
NM 87117-5671

Naval Aerospace Medical
Institute Library
Building 1953, Code 03L
Pensacola, FL 32508-5600

Command Surgeon
HQ USCENTCOM (CCSG)
U.S. Central Command
MacDill Air Force Base, FL 33608

Director
Directorate of Combat Developments
ATTN: ATZQ-CD
Building 515
Fort Rucker, AL 36362

U.S. Air Force Institute
of Technology (AFIT/LDEE)
Building 640, Area B
Wright-Patterson
Air Force Base, OH 45433

Henry L. Taylor
Director, Institute of Aviation
University of Illinois-Willard Airport
Savoy, IL 61874

Chief, National Guard Bureau
ATTN: NGB-ARS
Arlington Hall Station
111 South George Mason Drive
Arlington, VA 22204-1382

AAMRL/HEX
Wright-Patterson
Air Force Base, OH 45433

Commander
U.S. Army Aviation and Troop Command
ATTN: AMSAT-R-ES
4300 Goodfellow Bouvelard
St. Louis, MO 63120-1798

U.S. Army Aviation and Troop Command
Library and Information Center Branch
ATTN: AMSAV-DIL
4300 Goodfellow Boulevard
St. Louis, MO 63120

Federal Aviation Administration
Civil Aeromedical Institute
Library AAM-400A
P.O. Box 25082
Oklahoma City, OK 73125

Commander
U.S. Army Medical Department
and School
ATTN: Library
Fort Sam Houston, TX 78234

Commander
U.S. Army Institute of Surgical Research
ATTN: SGRD-USM
Fort Sam Houston, TX 78234-6200

Air University Library
(AUL/LSE)
Maxwell Air Force Base, AL 36112

Product Manager
Aviation Life Support Equipment
ATTN: SFAE-AV-LSE
4300 Goodfellow Boulevard
St. Louis, MO 63120-1798

Commander and Director
USAE Waterways Experiment Station
ATTN: CEWES-IM-MI-R,
CD Department
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

Commanding Officer
Naval Biodynamics Laboratory
P.O. Box 24907
New Orleans, LA 70189-0407

Assistant Commandant
U.S. Army Field Artillery School
ATTN: Morris Swott Technical Library
Fort Sill, OK 73503-0312

Mr. Peter Seib
Human Engineering Crew Station
Box 266
Westland Helicopters Limited
Yeovil, Somerset BA20 2YB UK

U.S. Army Dugway Proving Ground
Technical Library, Building 5330
Dugway, UT 84022

U.S. Army Yuma Proving Ground
Technical Library
Yuma, AZ 85364

AFFTC Technical Library
6510 TW/TSTL
Edwards Air Force Base,
CA 93523-5000

Commander
Code 3431
Naval Weapons Center
China Lake, CA 93555

Aeromechanics Laboratory
U.S. Army Research and Technical Labs
Ames Research Center, M/S 215-1
Moffett Field, CA 94035

Sixth U.S. Army
ATTN: SMA
Presidio of San Francisco, CA 94129

Commander
U.S. Army Aeromedical Center
Fort Rucker, AL 36362

Strughold Aeromedical Library
Document Service Section
2511 Kennedy Circle
Brooks Air Force Base, TX 78235-5122

Dr. Diane Damos
Department of Human Factors
ISSM, USC
Los Angeles, CA 90089-0021

U.S. Army White Sands
Missile Range
ATTN: STEWS-IM-ST
White Sands Missile Range, NM 88002

Director, Airworthiness Qualification Test
Directorate (ATTC)
ATTN: STEAT-AQ-O-TR (Tech Lib)
75 North Flightline Road
Edwards Air Force Base, CA 93523-6100

Ms. Sandra G. Hart
Ames Research Center
MS 262-3
Moffett Field, CA 94035

Commander
USAMRMC
ATTN: SGRD-UMZ
Fort Detrick, Frederick, MD 21702-5009

Commander
U.S. Army Health Services Command
ATTN: HSOP-SO
Fort Sam Houston, TX 78234-6000

U. S. Army Research Institute
Aviation R&D Activity
ATTN: PERI-IR
Fort Rucker, AL 36362

Commander
U.S. Army Safety Center
Fort Rucker, AL 36362

U.S. Army Aircraft Development
Test Activity
ATTN: STEBG-MP-P
Cairns Army Air Field
Fort Rucker, AL 36362

Commander
USAMRMC
ATTN: SGRD-PLC (COL R. Gifford)
Fort Detrick, Frederick, MD 21702

TRADOC Aviation LO
Unit 21551, Box A-209-A
APO AE 09777

Netherlands Army Liaison Office
Building 602
Fort Rucker, AL 36362

British Army Liaison Office
Building 602
Fort Rucker, AL 36362

Italian Army Liaison Office
Building 602
Fort Rucker, AL 36362

Directorate of Training Development
Building 502
Fort Rucker, AL 36362

Chief
USAHEL/USAAVNC Field Office
P. O. Box 716
Fort Rucker, AL 36362-5349

Commander, U.S. Army Aviation Center
and Fort Rucker
ATTN: ATZQ-CG
Fort Rucker, AL 36362

Dr. Sehchang Hah
Dept. of Behavior Sciences and
Leadership, Building 601, Room 281
U. S. Military Academy
West Point, NY 10996-1784

Canadian Army Liaison Office
Building 602
Fort Rucker, AL 36362

German Army Liaison Office
Building 602
Fort Rucker, AL 36362

French Army Liaison Office
USAAVNC (Building 602)
Fort Rucker, AL 36362-5021

Australian Army Liaison Office
Building 602
Fort Rucker, AL 36362

Dr. Garrison Rapmund
6 Burning Tree Court
Bethesda, MD 20817

Commandant, Royal Air Force
Institute of Aviation Medicine
Farnborough, Hampshire GU14 6SZ UK

Defense Technical Information
Cameron Station, Building 5
Alexandra, VA 22304-6145

Commander, U.S. Army Foreign Science
and Technology Center
AIFRTA (Davis)
220 7th Street, NE
Charlottesville, VA 22901-5396

Commander
Applied Technology Laboratory
USARTL-ATCOM
ATTN: Library, Building 401
Fort Eustis, VA 23604

Commander, U.S. Air Force
Development Test Center
101 West D Avenue, Suite 117
Eglin Air Force Base, FL 32542-5495

Aviation Medicine Clinic
TMC #22, SAAF
Fort Bragg, NC 28305

Dr. H. Dix Christensen
Bio-Medical Science Building, Room 753
Post Office Box 26901
Oklahoma City, OK 73190

Commander, U.S. Army Missile
Command
Redstone Scientific Information Center
ATTN: AMSMI-RD-CS-R
/ILL Documents
Redstone Arsenal, AL 35898

Aerospace Medicine Team
HQ ACC/SGST3
162 Dodd Boulevard, Suite 100
Langley Air Force Base,
VA 23665-1995

U.S. Army Research and Technology
Laboratories (AVSCOM)
Propulsion Laboratory MS 302-2
NASA Lewis Research Center
Cleveland, OH 44135

Commander
USAMRMC
ATTN: SGRD-ZC (COL John F. Glenn)
Fort Detrick, Frederick, MD 21702-5012

Dr. Eugene S. Channing
166 Baughman's Lane
Frederick, MD 21702-4083

U.S. Army Medical Department
and School
USAMRDALC Liaison
ATTN: HSMC-FR
Fort Sam Houston, TX 78234

NVESD
AMSEL-RD-NV-ASID-PST
(Attn: Trang Bui)
10221 Burbeck Road
Fort Belvoir, VA 22060-5806

CA Av Med
HQ DAAC
Middle Wallop
Stockbridge, Hants S020 8DY UK

Dr. Christine Schlichting
Behavioral Sciences Department
Box 900, NAVUBASE NLON
Groton, CT 06349-5900

Commander
Aviation Applied Technology Directorate
ATTN: AMSAT-R-TV
Fort Eustis, VA 23604-5577

COL Yehezkel G. Caine, MD
Surgeon General, Israel Air Force
Aeromedical Center Library
P. O. Box 02166 I.D.F.
Israel

HQ ACC/DOHP
205 Dodd Boulevard, Suite 101
Langley Air Force Base,
VA 23665-2789

41st Rescue Squadron
41st RQS/SG
940 Range Road
Patrick Air Force Base,
FL 32925-5001

48th Rescue Squadron
48th RQS/SG
801 Dezonias Road
Holloman Air Force Base,
NM 88330-7715

HQ, AFOMA
ATTN: SGPA (Aerospace Medicine)
Bolling Air Force Base,
Washington, DC 20332-6128

ARNG Readiness Center
ATTN: NGB-AVN-OP
Arlington Hall Station
111 South George Mason Drive
Arlington, VA 22204-1382

35th Fighter Wing
35th FW/SG
PSC 1013
APO AE 09725-2055

66th Rescue Squadron
66th RQS/SG
4345 Tyndall Avenue
Nellis Air Force Base, NV 89191-6076

71st Rescue Squadron
71st RQS/SG
1139 Redstone Road
Patrick Air Force Base,
FL 32925-5000

Director
Aviation Research, Development
and Engineering Center
ATTN: AMSAT-R-Z
4300 Goodfellow Boulevard
St. Louis, MO 63120-1798

Commander
USAMRMC
ATTN: SGRD-ZB (COL C. Fred Tyner)
Fort Detrick, Frederick, MD 21702-5012

Commandant
U.S. Army Command and General Staff
College
ATTN: ATZL-SWS-L
Fort Leavenworth, KS 66027-6900

ARNG Readiness Center
ATTN: NGB-AVN-OP
Arlington Hall Station
111 South George Mason Drive
Arlington, VA 22204-1382

Director
Army Personnel Research Establishment
Farnborough, Hants GU14 6SZ UK

Dr. A. Kornfield
895 Head Street
San Francisco, CA 94132-2813

ARNG Readiness Center
ATTN: NGB-AVN-OP
Arlington Hall Station
111 South George Mason Drive
Arlington, VA 22204-1382

Cdr, PERSCOM
ATTN: TAPC-PLA
200 Stovall Street, Rm 3N25
Alexandria, VA 22332-0413

HQ, AFOMA
ATTN; SGPA (Aerospace Medicine)
Bolling Air Force Base,
Washington, DC 20332-6188