



Improved Treatments Diminish Risk Of Hypertension Disqualification For Pilots

*Lifestyle changes and a wide variety of prescription drugs
have significantly lowered the threat of hypertension for pilots.*

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by

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For decades, hypertension (high blood pressure) was a major cause of heart disease and stroke and a frequent medical disqualifier for pilots. But today, hypertension should not be a cause of pilot medical disqualification, except in a very few cases.

Blood pressures exceeding 160 millimeters of mercury, systolic, and 95 millimeters of mercury, diastolic, are considered to fall well within the hypertensive range.¹ Systolic measurement refers to pressure when the heart is pumping; diastolic measurement refers to pressure when the heart is at rest. Prior to the increased understanding of the causes and remedies for high blood pressure, hypertension was blamed for enlarged hearts, damaged kidneys, headaches, fatigue, poor sleep, premature retirements, premature disabilities and premature deaths of many pilots.

Hypertension was a significant medical threat until the early 1970s, and was the catalyst behind implementation of the "age 60" retirement rule in 1960 for U.S. airline pilots. The prevalence of hypertension

was so high that when the precursors of the present U.S. Federal Aviation Administration (FAA) medical standards for first-class medical certificates were established, a progressive rise in blood pressure was built into the first-class standards with increasing age (Table 1, page 2). Today, most pilots who practice appropriate preventive measures (or receive modern treatment) do not experience this rising blood pressure per decade of increasing age.

The pilot population today should experience an extremely small rate of hypertension if appropriate preventive measures are instituted and if therapeutic steps are taken when necessary.

Major initiatives that can be taken by pilots to maintain a healthy blood pressure or to lower blood pressures that seem to be rising to hypertensive levels include lifestyle practices that incorporate regular exercise; avoidance of alcohol; avoidance of excessive salt intake; maintenance of a proper height-to-weight-body-build ratio; elimination of smoking; and incorporation of stress-reduction activities.

Table 1
FAA Part 67.13 First-class Medical Standard for Hypertension

<u>Age Group</u>	<u>Maximum Systolic</u>	<u>Maximum Diastolic</u>	<u>Maximum* Systolic</u>	<u>Maximum* Diastolic</u>
20-29	140	88	—	—
30-39	145	92	155	98
40-49	155	96	165	100
50-up	160	98	170	100

* Applicant at least 30 years of age with proven normal cardiac and kidney function whose reclining blood pressure is more than the maximum reading for his age group.

(Note: In the regulation, all blood pressures are measured while "reclining," although few pilots fly in the reclining position.)

Source: Stanley R. Mohler, M.D.

Until the 1950s, there were no effective antihypertensive medications recognized by the U.S. Food and Drug Administration (FDA) or considered acceptable by aeromedical authorities. Phenobarbital was prescribed by some physicians who hoped that its mood-modifying characteristics would diminish anxiety as a cause of hypertension. However, this did not work. Most hypertension causation has nothing to do with anxiety, and the health danger of addiction to phenobarbital far outweighed the danger of hypertension.

Diuretics containing mercury were marketed in the 1950s, but the mercury toxicity over time led aeromedical authorities to reject them. A surgical treatment of the sympathetic nervous system caused side effects, including a tendency to faint upon rapid standing or exposure to g-forces, which made this procedure incompatible with pilot medical certification.

New families of medications for hypertension began to appear in the 1960s. Today there are at least six major families of medications that can be individually tailored to a specific hypertensive patient. People who do not respond to treatment with a member of one medication family can be tested with a different drug.

Because a variety of systemic mechanisms can cause hypertension, the challenge for a pilot is to find the most effective medication or combination of medications acceptable to the FAA.³ It is important for the air crew member that an effective blood pressure-lowering medication with few side effects be found. If side effects such as drowsiness, decreased alertness, hypotension (blood pressure too low) or impaired sleep occur, then the medication cannot be used.

Tables 2 through 7 provide summaries of major categories of drugs used to treat hypertension. The generic

name of each drug is given along with the trade name. Certain potent drugs in the United States and other countries can only be obtained by prescription. The FDA and similar agencies in other countries have found these drugs to be effective and relatively safe when used under proper guidance. There are more than 1,300 of these generic drugs in the United States, each with a generic name assigned to it by the American Medical Association and the pharmaceutical industry.³

The listing of generic drugs (and trade name examples) in this article is incomplete, but a significant number of the FDA-approved prescription drugs are cited. Side effects mentioned will be general and incomplete. Specific information on a given drug should be obtained in the data sheet available from the manufacturer.

Calcium-channel blocking drugs are a relatively recent (past decade) group of drugs whose members have been effective in lowering blood pressure. Some occasionally reported side effects have included headache, swelling of the feet and ankles, and dizziness. The FAA has been certifying persons treated by this group of medications. Table 2 provides examples.

Inhibitors of angiotensin-converting enzyme (ACE) are shown in Table 3 (page 3). There are a number of examples of this group, which enjoys a relative degree of popularity. Occasional side effects may include loss of taste, skin allergy and coughing. Laboratory tests may find that the blood potassium is too high as a result of this medication. The FAA has been certifying individuals who are treated by this family of medications.

Vasodilator drugs are shown in Table 4 (page 3). Apresoline may have side effects that include headache or allergic reactions. Minoxidil may result in hair growth on various body locations. The FAA has been certifying individuals who are treated by this group of medications.

Table 2
Calcium-channel Blocking Drugs

<u>Generic Name</u>	<u>Example Trade Name</u>
Amlodipine	Norvasc
Diltiazem	Cardizem
Felodipine	Plendil
Isradipine	DynaCirc
Nicardipine	Cardene
Nifedipine	Procardia
Verapamil	Calan

Source: Stanley R. Mohler, M.D.

Table 3
Inhibitors of Angiotensin-converting Enzyme (ACE)

<u>Generic Name</u>	<u>Example Trade Name</u>
Benazepril	Lotensin
Captopril	Capoten
Enalapril	Vaseretic
Enalaprilat	Vasotec
Fosinopril	Monopril
Lisinopril	Zestril (also Prinvil, Prinzide)
Quinapril	Accupril
Ramipril	Altace

Source: Stanley R. Mohler, M.D.

Central sympatholytic drugs, shown in Table 5, act on central nervous system components, diminishing blood pressure, but sometimes cause tiredness, slow heart rate, sleepiness and allergic reactions. People have been certified on clonidine in this family, but the FAA has not approved many of these drugs for pilots. The FAA, for example, is concerned about the side effects of methyldopa.

Peripheral sympatholytic drugs may produce a net decrease in blood pressure through "antagonism" actions at the site where the "sympathetic" (excitatory) nervous system produces increased blood vessel tone. Some drugs in this category are shown in Table 6. Occasional side effects reported by some persons taking these drugs are decreased stamina, tiredness, hypotension, dizziness and nightmares. The FAA has approved some of these medications, but others, including reserpine, have not been approved.

Diuretic Drugs Often Prescribed First

Drugs with diuretic (urination-promoting) action are often the initial choice in the treatment of newly discovered hypertension. Examples may be grouped as shown in Table 7 (page 4). Side effects that may be caused by these drugs are skin rash, fatigue, elevated blood uric acid and excessively low or high blood potassium levels.

Table 4
Vasodilator Drugs

<u>Generic Name</u>	<u>Example Trade Name</u>
Hydralazine	Apresoline
Minoxidil	Loniten

Source: Stanley R. Mohler, M.D.

The FAA has approved all of the drugs in this category for pilot duties.

Most of the antihypertension medications listed are acceptable to the FAA for use by pilots. Consultation with the aviation medical examiner is recommended when a physician diagnoses a pilot with hypertension that requires medication. The examiner can then check with the FAA and determine what medications are acceptable.

Table 5
Central Sympatholytic Drugs

<u>Generic Name</u>	<u>Example Trade Name</u>
Clonidine	Catapres
Guanabenz	Wytensin
Guanfacine	Tenex
Methyldopa	Aldomet

Source: Stanley R. Mohler, M.D.

A continuing decline in death rates from coronary heart disease reflects the effectiveness of lifestyle improvements and proper treatment.⁴

A four-year study of 900 "mildly hypertensive" individuals found that with a sustained systolic blood pressure at 140 millimeters of mercury or greater, and/or a diastolic blood pressure at 90 millimeters of mercury or greater,

Table 6
Peripheral Sympatholytic Drugs

<u>Generic Name</u>	<u>Example Trade Name</u>
Acebutolol	Sectral
Atenolol	Tenormin
Betaxolol	Kerlone
Carteolol	Cartrol
Doxazosin	Cardura
Guanadrel	Hylorel
Guanethidine	Ismelin
Labetalol	Normodyne (also Trandate)
Metoprolol	Lopressor (with hydrochlorothiazide)
Nadolol	Corgard
Penbutolol	Levatol
Pindolol	Visken
Prazosin	Minipress
Propranolol	Inderal (also Inderide)
Reserpine	Diupres (with chlorothiazide)
Terazosin	Hytrin
Timolol	Blocadren

Source: Stanley R. Mohler, M.D.

Table 7
Diuretic Drugs

<u>Generic Name</u>	<u>Example Trade Name</u>
Amiloride	Midamor
Bendroflumethiazide	Corzide
Chlorthalidone	Hygroton
Chlorothiazide	Diuril
Ethacrynic Acid	Edecrin
Furosemide	Lasix
Hydrochlorothiazide	Esidrix
Polythiazide	Minizide
Spironolactone	Aldactone

Source: Stanley R. Mohler, M.D.

an individual should be considered for both improved lifestyle intervention and prescription drug treatment.⁵

Pilots who develop hypertension should institute lifestyle changes and obtain therapy, where recommended, to lower blood pressure. In addition, pilots who do not have hypertension should practice lifestyles that promote health and normal blood pressures. ♦

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HUMAN FACTORS & AVIATION MEDICINE

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Subscriptions: US\$55 U.S. (U.S.-Canada-Mexico), US\$60 Air Mail (all other countries), six issues yearly. • Include old and new addresses when requesting address change. • Flight Safety Foundation, 2200 Wilson Boulevard, Suite 500, Arlington, VA 22201-3306 U.S. • telephone: (703) 522-8300 • telex: 901176 FSF INC AGTN • fax: (703) 525-6047

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