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Advances in Medicine and Data Technology Will Bring Dramatic Changes to Civil Aeromedical Certification Process

Healthier lifestyles, new medical treatments and computer technology are making it easier for pilots to achieve and maintain medical flight certification.

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The first minimum medical standards for pilots were established in Germany in 1910.[1] These standards, and standards developed in other countries in the following years, were developed by military authorities to prevent people who might not be fit for military flight operations from becoming, or remaining, military pilots.

The era of human flight began during a time when tuberculosis was rampant. Streptococcal throat infections caused rheumatic heart disease as well as kidney disease; typhoid fever was widespread, and poliomyelitis caused permanent disabilities in survivors. After recovery from childhood diseases such as measles, chicken pox, mumps and diphtheria, millions of individuals experienced permanent adverse effects. The life expectancy during this period in the United States was about 50 years of age.

During World War I, some physicians assigned to examine pilots were given flight training, and the term "flight surgeon" was coined by the U.S. military.[1] A flight surgeon manual was published by the U.S. Government Printing Office, and the standards and tests it contained emphasized selecting people who could perform flight duties in addition to military missions.[2] A school for military flight surgeons was established in New York in May 1919 and subsequently moved to Brooks Field, Texas, in December 1922.[1] As military flight surgeons returned to civilian life after World War I, some of them became civilian aviation medical examiners when a U.S. federal regulatory program was established in 1926.[3]

The new civilian standards were relatively simple (less than two pages in a very small booklet) and had provisions for waivers.[4] U.S. civilian medical standards remained relatively unchanged until 1958, when the U.S. Federal Aviation Agency (FAA) [later the Federal Aviation Administration] was established and additional more-specific standards were prepared. The standards were proposed in 1959 for each of the three classes of medical certificates.[5] The requirement for a resting electrocardiogram (ECG) at age 35, age 40 and each year thereafter was developed by the FAA for Class I medical certificates (for airline transport pilots) at that time.

Table 1
Expectation of Life at Birth in the United States
1970 to 1990 and Projection to 2010

YEAR[2]	WHITE			BLACK & OTHER[1]			BLACK			ALL RACES[1]		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1970	71.7	68.0	75.6	65.3	61.3	69.4	64.1	60.0	68.3	70.6	67.1	74.7
1980	74.4	70.7	78.1	69.5	65.3	73.6	68.1	63.8	72.5	73.7	70.0	77.4
1990	76.1	72.7	79.4	71.2	67.0	75.2	69.1	64.5	73.6	75.4	71.8	78.8
2010*	78.3	75.1	81.5	N/A	N/A	N/A	72.2	67.3	77.0	77.6	74.2	81.1

* Projected
N/A Not Available

(1) Includes respondents who did not identify themselves as Black or White. Can include those of Asian, Native American, Eskimo or Pacific Island origin.

(2) Individual life expectancy at birth has steadily increased in the United States, reflecting increasingly healthy lifestyles, environment and better medical care.

Source: U.S. Department of Commerce, Bureau of the Census

In addition to the above changes, specific medical history items, for example, history of myocardial infarction, presence of angina pectoris, chronic alcoholism and diabetes requiring hypoglycemic medication, were explicitly re-emphasized in the standards. As a result, a large number of pilots began failing the civilian medical certification examinations.

Najeeb Halaby, the FAA's administrator appointed in 1961, recognized that many of the pilots grounded under the new medical standards could fly safely following individual assessment. These pilots were subsequently exempted from the standards by a special panel of consultant physicians who reported to Halaby.[3]

The FAA review panel, for example, began exempting pilots who had had myocardial infarctions but who had recovered fully except heart muscle scars that did not impair cardiac function. Depending on their recovery, pilots who had other medically disqualifying conditions were also exempted on an individual basis. Later, the exemption process was superseded by the "special issuance" procedure.

In the 1980s, the FAA decentralized the special issuance process, giving that responsibility to its Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma. Today the procedure for obtaining a special issuance has been streamlined, and the scope of special issuances has increased significantly.[6]

A 1993 FAA study found no differences in accident rates by pilots with "special medical issuances" compared with those without disqualifying conditions under the medical standards.[7]

Advances in Diagnosis and Treatment Help Prolong Medical Certification

Civil aviation medical authorities throughout the world are adopting a philosophy that uses scientific advances in diagnosis and treatment. U.S. epidemiological studies are showing vast improvements in individual health through lifestyle changes and medical advances (Table 1, page 2, and Table 2, page 3). Similar trends are reflected in other industrialized nations.

The diseases that impaired air crew health in the past are diminishing worldwide. Accordingly, medical certification can be safely accomplished for many more persons than ever before. In addition, the development of computer-assisted flight control systems, computer-generated electronic flight displays and global positioning satellites, along with other advanced navigation aids, have all diminished pilot workload significantly.

As the 21st century nears, individual flight crew members' responsibility for maintaining health will become increasingly important. When the population as a whole is healthy, the need for frequent detailed screening procedures is markedly less. The use of tobacco, for example, a leading cause of disability and death, is now increasingly viewed as behavior in conflict with flight professionalism. The same view is true for ethyl alcohol consumption.

Lifestyle practices that promote health like proper nutrition, reasonable exercise and suitable recreational activities are important individual pursuits that promote a lengthy,

Table 2
Average Expectation of Life in Years in the United States

Expected Years of Additional Life[1]

AGE/SEX*		WHITE	BLACK	ALL RACES[2]
Age 20:	Male	54.0	46.7	53.3
	Female	60.3	55.3	59.8
Age 40:	Male	35.6	30.1	35.1
	Female	41.0	36.8	40.6
Age 50:	Male	26.7	22.5	26.4
	Female	31.6	28.2	31.3
Age 65:	Male	15.2	13.2	15.1
	Female	19.1	17.2	18.9

* Age in 1990

(1) As an individual becomes older, the individual's likelihood for additional years of life will increase.

(2) Includes respondents who did not identify themselves as Black or White. Can include those of Asian, Native American, Eskimo or Pacific Island origin.

Source: U.S. Department of Commerce, Bureau of the Census

high-performance career. Thus, the benefits of enhanced population health and advances in science, medicine and aeronautics must be appreciated by air crew members and applied in their private and working lives. The same holds true for modern flight surgeons who, after developing trust, should work with air crew members to prevent disease and obtain special issuances where indicated.

Progress Made in Establishing Common Medical Standards

Ideally, all countries should have the same civil medical standards within flight operations categories. The International Civil Aviation Organization (ICAO) based in Montreal, Canada, works to establish common medical standards. Significant progress has been made in recent decades in the establishment and administration of agreed-upon civil medical standards among ICAO member countries.

The United States, Canada, Great Britain and Australia have been leaders in the individualization of medical certification for those pilots who do not meet certain published medical standards. This can be attributed in part to the large number of general aviation pilots in these countries, which has provided a substantial data base on special issuances (or similar procedures) that allow pilots who have disqualifying medical histories or conditions to fly. Many other countries are now modifying their medical certification procedures accordingly.

In the 21st century, the flight medical examination may be achieved by interactive television and computer. The pilot, while at home, may use biomedical data acquisition modules that would interact in real time with the aviation medical examiner. The examiner would have a video conference from the office with the pilot at home, taking the pilot's medical history and noting the acquired biomedical data, including sensory, neurologic, cardiovascular and interactive psychomotor coordination tests relevant to flying.[8] These tests exist in prototype today.[9] If a medical problem that requires further evaluation exists, a referral to the FAA or an appropriate specialist could be made.

For those pilots who immediately meet the medical standards, the medical certificate could be issued and transmitted to the pilot's computer printer. If the pilot does not meet the standards, a deferral or denial letter would be sent. The data on such actions would be sent to the FAA central medical facility where a permanent record would be maintained.

A potential dividend of such a certification system would be the capability to download preventive medicine lifestyle data to pilots, tailored to the individual pilot's medical needs. This would help pilots to remain healthy and to achieve a long flying career.

The above approach would markedly diminish the time and costs of periodic physical examinations. In the United States, for example, 900 examiners are currently entering the history and physical data on the pilots they examine into their personal computers and are transmitting these data by telephone to CAMI. All routine ECGs collected on Class I pilots in the United States are also transmitted by telephone to CAMI for computer assessment. These activities are the beginning of the future for civil air crew video certification. ♦

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