



## **‘Exercise-lite’ Enables Aviators to Reap the Benefits of Physical Activity**

*Regular sessions of aerobic exercise are still strongly recommended. But when such a program is impractical, considerable benefit can be derived from everyday activities such as bicycling, stretching, walking and even climbing stairs.*

*Stanley R. Mohler, M.D.*

*Wright State University School of Medicine  
Dayton, Ohio, U.S.*

Short periods each day of moderate physical activity will reduce significantly the risks of contracting leading chronic diseases, according to recent reports by the U.S. Centers for Disease Control. The findings, widely distributed by the U.S. Public Health Service, are good news for aviators disinclined to practice regular aerobic and other exercises.

Short exercise periods during the day, for a cumulative total of 30 minutes of moderately vigorous activity, have been shown to lower the risks of heart disease, high blood pressure, noninsulin-dependent diabetes mellitus, obesity, colon cancer, arthritis and bone loss.<sup>1</sup> Regular 30-minute sessions of continuous aerobic exercise three or four times a week are still strongly encouraged, but for those who do not maintain that schedule, the short periods of “exercise-lite” distributed throughout the day can yield outstanding results.

An exercise-lite program can be employed in everyday activities. For example, you can park in a shopping mall lot farther from the store that is the objective, and walk briskly to the destination. You can also, weather permitting, make daily energetic strolls in the home and work neighborhoods. Avoiding elevators and using the stairs is another approach. Getting from one gate to another at airports can be accomplished by walking, rather than using moving sidewalks and shuttle buses, if

there is time. Carrying items burns some additional calories (at a rate depending on their weight) and contributes to the total conditioning response.

Many common and even enjoyable activities provide considerable exercise benefits.<sup>2</sup> Some of these are shown in Table 1 (page 2).

A calorie is a measurement of energy; it is not a discrete component of food. Foods — carbohydrates, fats and proteins — are burned (metabolized) by the body to generate energy. The energy is measured in a unit: one kilocalorie = 1,000 calories. (One kilocalorie is defined as the amount of energy (heat) required to raise 2.2 pounds (one kilogram) of water 1.8 degrees F (one degree C).

A small elderly woman may only require about 1,000 calories (one kilocalorie) a day, while a large, physically active young man may require as much as 4,000 calories (four kilocalories) a day. Thus, everyone requires calories, but the number of calories required varies based on individual energy needs.

Although the figures will vary somewhat from person to person, running 10 minutes will burn 64 calories in a 176-pound man, while running 10 minutes will burn 44 calories in a

**Table 1**  
**Energy Costs of Selected**  
**Physical Activities**

Activity	Calories Burned in 10 Minutes	
	Men*	Women*
Sleeping	7	5
Driving a car	16	11
Housecleaning, light to moderate	20	14
Sitting, playing with children	20	14
Automobile repair	24	17
Throwing frisbee	24	17
Walking for pleasure	28	19
Bicycling to work for pleasure (< 10 mph)	32	22
Raking leaves	32	22
Swimming (moderate effort)	32	22
Dancing (on average)	36	25
Golf	36	25
Stationary bicycling (on average)	40	28
House painting	40	28
Gardening	40	28
Stair-treadmill (on average)	48	33
Ice skating	56	39
Running	64	44

\* Standardized to 176 lb. male

\*\* Standardized to 121 lb. female

Source: Stanley R. Mohler

121-pound woman (Table 1); walking 10 minutes for pleasure burns 28 and 19 calories, respectively, for the man and the woman. More people can incorporate walking, rather than running, into their work days, which is one way to burn calories.

Many people associate exercise with weight reduction or for maintaining appropriate weight. From a caloric standpoint, exercise results in calories being burned. Thus if a person adds exercise to a daily routine, while maintaining the same level of caloric intake, a reduction in weight is likely. The more vigorous the exercise, the more time spent exercising and the more frequent the exercise, the more calories will be

burned. Nevertheless, if the daily intake of calories is equal to the calories burned daily, a healthy person's weight will remain stable.

When caloric intake is less than calories burned, stored fat is burned; when caloric intake is greater than calories burned, the energy from the excess calories is stored as fat.

Consider that during the course of one year if a person's caloric burn rate remained stable, but the daily intake of calories increased by just 80 calories — a slice of bread — the person would add some 29,200 calories (8.3 pounds [3.8 kilograms]) by the end of the year.

On the other hand, based on Table 1, a man who adds 30 minutes of pleasure walking, three times a week to his normal activities, without increasing his caloric intake, will burn approximately 252 calories a week or 13,104 calories per year. Thus, by the end of one year, he will have lost 3.7 pounds (1.7 kilograms).

The stair-treadmill exerciser caloric burns (Table 1) are 48 and 33 for men and women respectively, indicating that using a building's stairs helps burn calories. When walking more and using the stairs more, comfortable shoes with rubber soles and heels are highly recommended because any foot pain or other discomfort will discourage walking. Selection of proper shoes for aircrew was described in a prior issue.<sup>3</sup>

Various household activities noted in Table 1, including gardening and leaf raking, contribute to reducing calories. Those who find these activities boring can wear a portable cassette player. If, besides these activities, an aviator maintains an exercise program, no problems with excessive fat can be expected if there is a reasonable daily intake —and intelligent selection — of food, and the consumption of minimum alcohol, if any. A high level of conditioning should result. An earlier article describes some methods for aircrews to keep fit, especially during layovers.<sup>4</sup>

In maintaining fitness and controlling weight, it helps to adopt hobbies that burn calories. One useful activity is swimming. Tennis and other aerobic activities contribute significantly to maintaining fitness. [Aerobic is derived from the Greek *aer*, air, and *bios*, life. Thus, aerobic suggests "life in air."]

Anyone who has not exercised regularly for a period of years should be cautious about moving from an exercise-lite program to a vigorous aerobic exercise regimen. Your physician should be included in the development of an exercise program that best fits your physical condition. A stress electrocardiogram may be suggested if:

- Your age is more than 35 years;
- Your family history includes coronary heart disease for those under the age of 55 years;

- You are male and have another coronary heart disease risk factor such as high cholesterol, high blood pressure or cigarette smoking; or,
- You are female and have two risk factors for coronary heart disease.

The human skeleton comprises 212 bones that support the internal organs and the engines of motion, the muscles. These bones are joined precisely, many surfaces meeting in a near-exact fit. This is particularly true for the 26 bones of the foot and ankle. Upon arising in the morning, the lubricating fluid in the joints between these many bones of the foot will be less evenly distributed as a result of loading pressures and the diminished activity during sleep. Accordingly, when you awaken each day, you will benefit by moving the feet around and by giving them a brief massage.

In the morning and the evening, perform leg stretches. A couple of minutes of stretching brings blood into the muscles, toughens the tendons and ligaments and benefits overall health. Of course, stretching while driving, and while flying when a cruising period allows for it, promotes alertness.

Do the same for the Achilles tendon and the calf muscles. Also, flex each knee several times. Some leg raises will help warm up the hips and distribute lubricating fluid. A few sit-ups will help put the spine in shape and better prepare it for the load bearing required by daily activities. Swing the shoulders; massage and move the elbows and hands. Next, flex the neck right and left, fore and aft, and move the head around a few times. These minimal exercises and a bit of subsequent stretching will prepare the body machinery for the day's activities.

You can do a variety of small tasks throughout the day to enhance conditioning. One helpful measure is to keep in your flight bag a small hand exerciser, of the type found in sport and exercise equipment stores. Periodically using this hand exerciser while in cruise flight, at home or at layovers is a superb way to develop and maintain conditioning of the hands, the wrists and forearm muscles. You can obtain immense benefits by this simple method over months and years.

Another useful adjunct to brief periods of exercise is to have handy a bungee, or rubber, stretcher. A bicycle inner tube will do well. The stretcher need not require a great deal of strength but it will help limber the arms and shoulders, lessen fatigue and promote conditioning. Such a stretcher is light and can be carried in an overnight bag.

You can alleviate the sedentary behavior that has evolved along with televisions and video cassette recorders by intermingling stretching, sit-ups and push-ups while watching programs. Cumulatively, this practice will contribute to daily conditioning, while developing feelings of comfortable relaxation and

diminishing feelings of agitation resulting from disturbing news programs and other shows. These exercises should also result in faster, deeper and more refreshing sleep.

More good news comes from a recent study, which shows that recreational exercise over a period of years results in a markedly lower risk of a heart attack.<sup>5</sup> Accordingly, viewing exercise-lite as a form of recreation that yields mental enjoyment encourages an activity that diminishes heart attack risk. This attitude provides for miniature recreations throughout the day. The key is how exercise-lite is perceived. For example, if climbing stairs to attend a meeting is viewed as a mini-recreational session that yields satisfaction, the cumulative effects will be similar to those of a dedicated recreational exercise period of one hour or so.♦

## References

1. U.S. Public Health Service, Office of Disease Prevention and Health Promotion. "Prevention Report." October/November 1994: 1-4.
2. Ainsworth, B.; Haskell, W. et al. "Energy Costs of Human Physical Activities." *Official Journal of the American College of Sports Medicine* (January 1993): 71-80.
3. Mohler, S. "Flight Crew Footwear: Functional Essentials." *Human Factors Bulletin*. Volume 29 (January/February 1983): 1-3.
4. Mohler, M.; Mohler, S. "Maintain Physical Fitness During Layover." *Human Factors and Aviation Medicine*. Volume 39 (July/August 1992): 1-4.
5. Lakka, T.; Venalainen, J. et al. "Relation of Leisure-time Physical Activity and Cardiorespiratory Fitness to the Risk of Acute Myocardial Infarction in Men." *New England Journal of Medicine*. Volume 330 (June 2, 1994): 1549-1554.

## About the Author

*Stanley R. Mohler, M.D., is a professor and vice chairman at Wright State University School of Medicine in Dayton, Ohio, U.S. He is director of aerospace medicine at the university.*

*Mohler, an airline transport pilot and certified flight instructor, was director of the U.S. Federal Aviation Agency's Civil Aviation Medicine Research Institute (now the Civil Aeromedical Institute) for five years and chief of the Aeromedical Applications Division for 13 years.*

*He has written several books on pilot medications and a book about aviator Wiley Post.*

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Flight Safety Foundation (FSF) and Transport Canada will conduct at Airshow Canada on Aug. 10, 1995, a Risk Management Seminar that will examine how an aviation safety program can improve profitability. The important role of company management, which is increasingly being held responsible for the success of aviation safety programs, will be discussed in detail.

Topics will include well-analyzed problems and their solutions; skillful cost-benefit analysis as the cornerstone of an effective and efficient safety program; the obligation to establish a safety program in the same way that a company introduces a new aircraft to the fleet; and the importance of creating a clear and comprehensive accident/incident response plan. No fee will be required for admittance to the seminar.

Airshow Canada will be held Aug. 9–11 [industry-only days; public days will be held Aug. 12 & 13.] in Abbotsford, British Columbia, Canada. Free preregistration is available before July 7 for industry-only days. In addition to the FSF/Transport Canada seminar, there will be a variety of other conferences and symposia during the Airshow. The Canadian Business Aircraft Association will be conducting its annual convention in Vancouver, while its tradeshow exhibits and static displays will be combined with Airshow Canada at Abbotsford. For more details, contact Airshow Canada. Telephone: (604) 852-3704 and Fax: (604) 852-4600.

## **Flight Safety Foundation/Transport Canada Risk Management Seminar Airshow Canada Aug. 10, 1995**

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