



★PREVENTION OF HEAT STRESS DISORDERS

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This instruction implements AETC 48-1, *Aerospace Medical Program*. It establishes the Air Education and Training Command (AETC) policy for preventing the adverse effects of heat stress during ground activities. This instruction applies to all permanent party government employees (military and civilian) assigned to AETC installations, all personnel attending training administered by AETC, and AETC units located at non-AETC installations for training administered by AETC. It also applies to the Air National Guard (ANG) and Air Force Reserve Command (AFRC) personnel when they receive training administered by AETC. It does not apply to training conducted in water or during flight. It also does not apply to contractor personnel. The impact of adjusting AETC civilian employee work hours due to work and rest cycles must be processed through local labor management. Each AETC installation will supplement this instruction to specify local procedures. During mission-essential, contingency, or emergency operations, squadron commanders may waive the provisions of this instruction. However, when commanders waive procedures they must ensure all supervisors exercise caution, make certain all supervisors and subordinate personnel are aware of heat stress disorder signs and symptoms, and take actions to protect the health of their personnel. Military operations and training are inherently risky. The requirements of this instruction are aimed at reducing the risk of heat stress disorders among our people. See Attachment 1 for a glossary of references and supporting information used in this publication.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

1. Responsibilities:

1.1. Wing Commanders:

1.1.1. Establish procedures to implement this instruction.

1.1.2. Supplement this instruction as required by paragraph 8.

1.2. Group and Squadron Commanders:

1.2.1. Implement activity levels and fluid replacement requirements for personnel in training status.

1.2.2. Brief supervisors annually on the requirements of this instruction, the local supplement, and unit-specific procedures to minimize the risk of heat stress disorders.

1.2.3. Brief supervisors and workers on the signs and symptoms of heat stress disorders (see Figure 1) and how to minimize the effects of heat stress during training exercises when personnel wear the ground crew chemical defense ensemble or other similarly impermeable clothing. Make adjustments to the wet bulb, globe temperature (WBGT) index as indicated in the notes to Table 1. Figure 2 provides various work load examples. Consult with aerospace physiology or bioenvironmental engineering for assistance in work classification.

Figure 1. Heat Stress and Water Intoxication Warning Signs and Symptoms.

EARLY SIGNS AND SYMPTOMS	ACTIONS
<ul style="list-style-type: none"> • Dizziness • Headache • Dry mouth • Unsteady walk • Weakness • Muscle cramps 	<ul style="list-style-type: none"> • Remove from training • Allow casualty to rest in shade • Take sips of water • If signs or symptoms do not improve in 15 to 30 minutes, transport to medical facility • If signs or symptoms worsen, call ambulance
LATER SIGNS AND SYMPTOMS	IMMEDIATE ACTIONS
<ul style="list-style-type: none"> • Hot body, high temperature • Confusion, unresponsiveness, coma • Vomiting • Involuntary bowel movement • Convulsions • Weak or rapid pulse 	<ul style="list-style-type: none"> • Call ambulance for immediate transport to hospital • Lay person down in shade with feet elevated until ambulance arrives • Give <u>sips</u> of water while waiting for ambulance • Begin active cooling, if skin is hot to touch • Undress as much as possible • Pour cool water over person and fan

Table 1. Training Requirements for Hot Environments. (note 1)

L I N E	A	B	C		D		E	
	Heat Category (Flag Color)	Temperature Range WBGT (°F) (notes 2, 3)	Easy Work (100 - 335 Watts)		Moderate Work (335 - 500 Watts)		Hard Work (500 - 700 Watts)	
			Work/ Rest (note 4)	Water Intake Qt/hr (note 5)	Work/ Rest (note 4)	Water Intake Qt/hr (note 5)	Work/ Rest (note 4)	Water Intake Qt/hr (note 5)
1	1 (White)	78 - 81.9	No limit	1/2	No limit	3/4	40/20 min	3/4
2	2 (Green)	82 - 84.9	No limit	1/2	50/10 min	3/4	30/30 min	1
3	3 (Yellow)	85 - 87.9	No limit	3/4	40/20 min	3/4	30/30 min	1
4	4 (Red)	88 - 89.9	No limit	3/4	30/30 min	3/4	20/40 min	1
5	5 (Black)	> 90	50/10 min	1	20/40 min	1	10/50 min	1

NOTES:

1. These values will sustain performance and hydration for at least 4 hours of work in the specified heat category. (Values are based on US Army Research Institute for Environmental Medicine recommendations; US Army policy.)
2. Wearing body armor adds 5 °F to measured WBGT.
3. When performing activities with ground crew ensemble, fire-fighting gear, or other restrictive or impermeable clothing, make arrangements for remote site measurement of the WBGT and add 10 °F to the measurement (add 15 °F if also wearing body armor). These adjustments account for the clothing and equipment effects on evaporative cooling (increased barrier) and any increase in work due to the additional load.
4. Rest means minimal physical activity (sitting or standing) accomplished in the shade if possible (but not necessary).
5. Individual water need will vary +/- 1/4 quart per hour.

CAUTION

Hourly fluid intake should not exceed 1 1/2 quarts; daily fluid intake should not exceed 12 quarts. Rapid ingestion of large amounts of water (greater than 1 1/2 quarts per hour) may lead to hyponatremia (acute water intoxication), which is a life-threatening condition that may lead to weakness, convulsions, loss of consciousness, and death if not recognized and treated promptly.

Figure 2. Work Load Examples.**Easy Work**

- Walking hard surface at 2.5 miles per hour (mph), < 30 pound (lb) load
- Weapon maintenance
- Manual of Arms
- Marksmanship training
- Drill and ceremony
- Repair, airplane or automobile
- Repair, wiring, plumbing
- Occupation, carpentry, general
- Occupation, walking 3.0 mph, moderately and carrying light objects < 25 lbs
- Occupation, walking on job, < 2.0 mph, very slow
- Occupation, police, directing traffic (standing)

Moderate Work

- Walking hard surface at 3.5 mph, < 40 lb load
- Walking loose sand at 2.5 mph, no load
- Walking, carrying 1 - 15 lb load, upstairs
- Patrolling
- Individual movement techniques, such as low crawl, high crawl
- Defensive position construction
- Field assaults
- Cleaning, heavy or major (for example, wash car, wash windows, mop)—vigorous effort
- Conditioning exercise, calisthenics light or moderate effort
- Lawn and garden, mowing lawn, walk, power mower
- Repair, painting, papering, plastering, scraping

Hard Work

- Walking hard surface at 3.5 mph, \geq 40 lb load
- Walking loose sand at 2.5 mph with load
- Walking, carrying 16 - 49 lb load, upstairs
- Running, 5 mph (12 minutes per mile)
- Lawn and garden, mowing lawn, hand mower
- Occupation, truck driving, loading and unloading truck (standing)
- Occupation, moving, pushing heavy objects, 75 lbs or more (desks, moving van work)
- Conditioning exercise, calisthenics (push-ups, pullups, situps)—heavy, vigorous effort
- Occupation, carrying heavy loads (such as bricks)
- Occupation, carrying moderate loads upstairs, moving boxes (16 - 40 lbs)

1.3. Supervisors:

1.3.1. Brief workers annually on the requirements of this instruction, the local supplement, and unit-specific procedures to minimize the risk of heat stress disorders. Document training in accordance with AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program*.

1.3.2. Plan activities to meet the requirements of this instruction, as applicable, and educate personnel on proper water intake, work restrictions, and rest restrictions.

1.3.3. Disseminate the heat category and flag color conditions (Table 1) to workers and trainees when informed through established notification procedures.

1.3.4. Identify workers or trainees displaying signs and symptoms of heat stress and implement appropriate actions as identified in Figure 1.

1.3.5. Consult with representatives of the aerospace medicine squadron or flight, as needed, to verify acclimatization levels and appropriate curtailment recommendations unique to specific work or training requirements.

1.3.6. Consider principles of acclimatization when planning outdoor activities in hot environments.

1.4. Personnel Attending Training Administered By AETC. Personnel attending training administered by AETC are subject to the requirements of this instruction. Detachments and operating locations (OL) on other than an AETC base will:

1.4.1. Coordinate with the host base bioenvironmental engineer or other preventive medicine personnel to determine the method used to locally determine the WBGT index and disseminate its value.

1.4.2. Specify in writing, (for example, an operating instruction) how they will determine WBGT from the host installation in order to implement the work and rest recommendations and water intake requirements of Table 1 and Figure 2. Operating instructions should provide procedures for medically notifying course supervisors of any trainees at increased risk of heat stress disorder due to illness or medication and for documenting WBGT measurements for later retrieval. Provide a copy to HQ AETC/SGPB.

NOTE: The Army, Navy, and Marine Corps have similar guidelines for heat stress based on the WBGT index. Additionally, most Air Force installations have local procedures in place to determine WBGT during periods of hot weather.

1.5. AETC Personnel Attending Training Not Administered By AETC. AETC personnel attending training not administered by AETC (for example, training administered by the Army, Navy) will follow the guidelines established by that unit, at that installation, instead of the guidance contained in this instruction.

1.6. Medical Service. Aerospace medicine contains a unique collection of expertise to assist unit commanders and supervisors. Commanders may wish to use this expertise to educate installation, tenant,

and remotely located units on the medical aspects of this instruction. Specific functional area responsibilities are assigned below:

1.6.1. Flight Medicine:

1.6.1.1. Advise unit commanders and supervisors on prevention of heat stress.

1.6.1.2. Establish procedures for processing AF Form 422, **Physical Profile Serial Report**, according to paragraph 7.3 and AFI 48-123, *Medical Examinations and Standards*.

1.6.1.3. Assist bioenvironmental engineering (BE) in writing the supplement to this instruction.

1.6.2. Public Health:

1.6.2.1. Assist supervisors in developing appropriate training materials for supervisors, workers, and trainees.

1.6.2.2. Analyze occupational illness data to determine adverse trends and report according to paragraph 7.2.

1.6.2.3. Assist BE in writing the supplement to this instruction.

1.6.3. Bioenvironmental Engineering (BE):

1.6.3.1. Write the installation supplement to this instruction required by paragraph 8.

1.6.3.2. Determine the appropriate procedures to measure and report the WBGT index.

1.6.3.3. Incorporate heat stress evaluations into the routine and special surveillance programs established by AFI 48-145, *Occupational Health Program*. Surveillance must include an annual review of the training plan or curriculum of training courses that exposes trainees to hard work under heat category 1 (white flag) or above, as defined in Table 1 and Figure 2.

1.6.4. Aerospace Physiologist. In consult with the USAF School of Aerospace Medicine Performance Enhancement Division, aerospace physiologists will:

1.6.4.1. Assist supervisors in determining work rate and preventive measures.

1.6.4.2. Assist BE in writing the supplement to this instruction.

1.6.5. Clinical Providers:

1.6.5.1. Must implement procedures to notify the public health flight of any heat stress disorder associated with work or training activities as required by paragraph 7.3.

1.6.5.2. Must be educated at least annually on this instruction and the local supplement, emphasizing their role in establishing recommendations or other restrictions during the hot season for workers and

trainees who have been ill.

2. Assessing Environmental Conditions for Heat Stress:

2.1. Measuring deep body temperature is impractical for monitoring heat load; therefore, environmental factors must be measured. The WBGT index is the simplest and most suitable technique to measure environmental factors that most nearly correlate with deep body temperatures and other physiological responses to heat. Refer to the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) (published annually) for more information. The formula to determine the WBGT index is:

Outdoors with Solar Load: $WBGT = 0.7\text{ NWB} + 0.2\text{ BG} + 0.1\text{ DB}$

Indoors or Outdoors with No Solar Load: $WBGT = 0.7\text{ NWB} + 0.3\text{ BG}$

(DB = Dry Bulb; BG = Black Globe; and NWB = Natural Wet Bulb)

2.2. To determine the WBGT index, use either the field apparatus described in the ACGIH TLV booklet, the portable hand-held WBGT kit (NSN 6665-00-159-2218), or a suitable commercially available instrument. BE must specify in the local supplement where WBGT measurements are taken on the installation. Measurements shall represent the conditions that most closely relate to the training or working conditions. For example, the WBGT inside an open hangar will be different than if measured outdoors with solar load. If WBGT measurements are taken at remote locations, the local supplement must specify who is responsible for taking the remote site measurements and how this information is recorded and reported. BE must certify the competency of any other functional area in taking and reporting these measurements.

2.3. When the predicted or actual outside temperatures reach 85 °F as a daily high, measure WBGT at least four times, evenly spaced, during the hottest part of the day. For example, measurements might be at 1000, 1200, 1400, and 1600 or 0900, 1100, 1300, and 1500. It may be wise to perform more WBGT measurements during particularly hot days.

2.4. When the WBGT index reaches 85 °F, measure WBGT at least hourly during normal duty hours. At technical training wings with scheduled weekend or after-hour outdoor activities for trainees, develop procedures for measuring the WBGT index during these times.

2.5. BE may perform baseline heat stress evaluations to establish the normal average and range of WBGT index temperatures for indoor hot environments where personnel are occupationally exposed to hot environments. Validate the baseline data during routine surveys at frequencies established by AFI 48-145. Examples of such environments are steam pits and tunnels, confined spaces heated by radiant exposure to the sun, and boiler rooms.

3. General Requirements to Prevent Heat Stress Disorders. The following topics discuss actions to help prevent heat stress disorders:

3.1. Education. Personnel working and/or training in hot environments must be educated on the causes, signs and symptoms, first-aid treatment, and prevention of heat disorders. Instruct workers and trainees

to inform supervisors if they are experiencing any of the following conditions that may contribute to heat injury:

- 3.1.1. Acute or chronic infection or fever.
- 3.1.2. Sickle cell trait.
- 3.1.3. Reaction to an immunization.
- 3.1.4. Vascular disease.
- 3.1.5. Inability to sweat.
- 3.1.6. Heat rash or acute sunburn.
- 3.1.7. Previous heatstroke.
- 3.1.8. Recent use of alcohol.
- 3.1.9. Dehydration.
- 3.1.10. The lack of sleep or fatigue.
- 3.1.11. Being overweight or overfat.
- 3.1.12. Taking medications and drugs.
- 3.1.13. Using certain herbal and nutritional supplements (particularly the ephedra class).
- 3.1.14. Pregnancy.

3.2. Water. Adequate water intake is essential to replace water lost through sweating, respiration, and elimination. Encourage personnel to begin hydrating several days before a lengthy and/or high performance exposure to hot conditions to ensure adequate hydration beforehand. Advise personnel to begin water consumption at the recommended rate up to 2 hours before starting the activity when possible. Table 1 provides guidelines for fluid replacement based on the WBGT and activity level. It is better to drink small amounts of water frequently (for example, one-fourth of a canteen every 15 to 30 minutes) than to drink larger amounts less frequently. Make cool water available, when possible, for personnel to refresh their canteens. When the activity is complete, fluid replacement at the rate specified in Table 1 should continue for approximately 2 hours. Alcoholic and caffeinated beverages do not make up for water loss. Carbonated beverages are not as effective as noncarbonated beverages in keeping the body hydrated because of delayed absorption. Inform personnel not to exceed an hourly fluid intake of 1 1/2 quarts or total daily fluid intake of 12 quarts. Educate personnel on the importance of remaining hydrated during strenuous activity conducted at temperatures below the established heat categories and flags in Table 1.

3.3. Electrolyte Replacement. The preferred method of electrolyte replacement after exposure to hot

conditions is a solid meal, as part of a balanced diet. Salt food to taste, but do not add additional salt to the diet. Do not use salt tablets except under special operating environments when ordered by a competent medical authority. Sports drinks with high electrolyte content are acceptable as interim measures, but should not substitute for meals.

3.4. Clothing. Wear loose-fitting clothing if possible, especially at the neck and wrist, to allow air circulation. When exposed to the sun's rays, cover yourself and apply a sunblocking lotion to prevent sunburn. When not exposed to the sun or other radiant heat source, consider wearing the least allowable amount of clothing.

3.5. Work Schedules. Modify work schedules to perform the heaviest work in the coolest parts of the day. Establish work and rest cycles as required by this instruction when working in hot environments. Rest means minimal physical activity, sitting or standing, accomplished in the shade if possible, but not necessary.

3.6. Acclimatization:

3.6.1. Acclimatization is defined as the adaptive changes that occur when an individual undergoes repeated or prolonged heat exposure and the concomitant reduction in physiological strain produced by the hot environment. Acclimatization is achieved by repeated exposures to a heat stress sufficient to raise internal body temperature to levels that provoke moderate to profuse sweating; this is most effectively accomplished by exercising or working in the heat. Acclimatization to heat begins with the first exposure; at least 7 to 14 days of exposure are required to reach approximately 95 percent of maximal physiological response.

3.6.2. Higher levels of aerobic conditioning from exercise in thermoneutral or cool environments provide a partial degree of acclimatization, but not complete acclimatization. Also, acclimatization is specific to the environmental vapor pressure; that is, adaptations to hot-humid conditions are different than those to hot-dry conditions. Individuals who will exercise or work in the heat should increase their state of acclimatization by gradually increasing exercise or work exposure during the approximately 2-week period before the scheduled activity. Supervisors must note that several factors, including inter-individual differences, affect the rate and magnitude of acclimatization. **NOTE:** Acclimatization is not necessary to implement the requirements of Table 1. The work and rest restrictions are sufficiently conservative to minimize the risk of heat stress disorders, even among unacclimatized individuals.

3.6.3. When an unacclimatized worker is exposed to heat, he or she may experience some discomfort and signs of heat strain, such as high body temperature, increased heart rate, and fatigue on the first day. On each succeeding day, the worker's ability to perform at the same level of heat stress improves as signs of discomfort and strain diminish. During the approximately 2 weeks it takes to acclimatize, the worker should be especially aware of the signs and symptoms of heat stress disorders and should drink an adequate quantity of water as indicated in Table 1. After a period of approximately 2 weeks, a worker should be able to perform all tasks without difficulty.

3.6.4. Individuals who are seasonally exposed to strenuous duties or heavy work undergo acclimatization each year. This may occur during regular duty or work as outside temperatures increase during the spring and summer.

3.7. Heat Syncope. Heat syncope is the term used to describe fainting immediately after exertion without proper cool down, or while standing erect and immobile in heat due to pooling of the blood in dilated vessels and in the lower parts of the body. Heat syncope following exertion may be prevented by ensuring proper cool down, such as continuous walking and flexing the muscles in the arms and legs for at least 5 to 10 minutes or until the heart rate has dropped below 120 beats per minute. To help prevent heat syncope during parades conducted in hot environments, select acclimatized personnel to participate and have them drink 1 quart or canteen of water over the hour preceding parades. Also instruct participants to intermittently move their arms and legs to assist the return of blood to the heart.

4. Preventing Heat Stress Disorders in Training Environments:

4.1. Supervisors of personnel in training status will use the activity level restrictions in Table 1 to plan and conduct outdoor training and troop movements for individuals under their control. Paragraph 5 addresses recommendations for single training events conducted solely for the purpose of physical conditioning (PC). All trainees will be considered unacclimatized unless exposed to increasing levels of exertion in WBGT heat conditions. The actual number of days to acclimate will depend on many factors and will be determined for each course based on the training schedule and prior heat category levels during the acclimatization process.

4.2. Although trainees may eventually become acclimated, the body's tolerance to heat may be reduced based on the conditions listed in paragraph 3.1. Trainees must be educated to inform instructors of these conditions so that proper adjustments in training activities can be made. Depending upon the seriousness of the condition, these adjustments can include more closely observing the affected personnel, reducing the activity rate and/or time, or referring the trainee to a clinical provider for an evaluation.

5. Preventing Heat Stress Disorders During Physical Conditioning (PC) Activities. PC activities conducted for the sole purpose of fitness improvement should be conducted before the onset of heat categories when possible. Physical conditioning conducted in PC uniform (shorts and t-shirt) may be performed continuously up to 1 hour in all but black flag heat condition. Limit PC in black flag heat conditions to 40 minutes of continuous activity. These guidelines are based on a single isolated training event. Use Table 1 to determine fluid intake guidelines based on the intensity of the PC activity.

6. Preventing Heat Stress Disorders in Occupational Work Environments (Nontraining):

6.1. Personnel who routinely perform their jobs while exposed to hot environments (such as aircraft maintenance, grounds maintenance, and repair work in steam pits and tunnels) are occupationally exposed.

6.2. Supervisors of occupationally exposed personnel should use Table 2 to plan work and rest cycles for individuals under their control. The WBGT values listed in the table are screening values for the particular work rate indicated. These values are extracted from the ACGIH TLV booklet. Refer to the ACGIH TLV booklet and Documentation of Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) for more detailed information on the application of these screening values. **NOTE:** The heat category and flag color from Table 1 do not apply to occupationally exposed workers.

Table 2. Permissible Heat Exposure Limits. (note)

L I N E	A	B	C	D	E	F	G	H	I
	Work Demands	Acclimatized				Unacclimatized			
		Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
1	100% work	85	81.5	79		81.5	77	72.5	
2	75% work; 25% rest	87	83.5	81.5		84	79	76	
3	50% work; 50% rest	89	85	83.5	81.5	86	82.5	80	77
4	25% work; 75% rest	90	88	86	85	88	84	82.5	80

NOTE: Values given in °F WBGT.

6.2.1. Exposure limits are based on personnel working in normal summer work clothing. Add 3.5 °F to the measured WBGT for personnel working in cloth coveralls and 7 °F for personnel working in double-cloth overalls.

6.2.2. Exposures above 90 °F WBGT should be allowed only when performing mission-essential duties, and only then with caution. When necessary to accomplish a task, two or more details should be arranged to work in sequence to ensure each crew receives the proper work and rest cycle. *The amount of inter-individual variability in response to heat strain cannot be emphasized enough—hence, extreme caution is needed.*

6.3. Rank each job into light, medium, heavy, or very heavy categories on the basis of type of operation to determine the workload category.

6.3.1. Light work would correspond to sitting with moderate arm and leg movements, standing with light work at machine or bench, using a table saw, or standing with light or moderate work at machine or bench and some walking about.

6.3.2. Moderate work would correspond to scrubbing in a standing position, walking about with moderate lifting and pushing, or walking on a level surface at approximately 3 miles per hour carrying a 7-pound load.

6.3.3. Heavy work would correspond to carpenter sawing by hand, shoveling dry sand, heavy assembly work, or intermittent heavy lifting with pushing or pulling (pick and shovel work).

6.3.4. Very heavy work corresponds to shoveling wet sand. Because of the physiological strain associated with very heavy work among less fit workers regardless of the WBGT, criteria values are not provided for continuous work and for up to 25 percent rest in an hour. Consider a more detailed analysis and/or physiological monitoring for these conditions.

7. Recognition, First-Aid Treatment, and Investigation of Heat Stress Disorders:

7.1. There are several recognized heat stress disorders described in Attachment 1, Terms. Individuals must be trained to recognize when they or their fellow trainees or workers are experiencing the signs and symptoms of any of these disorders. Early signs and symptoms and actions are identified in Figure 1, along with the later signs and symptoms and immediate actions to respond to such individuals.

7.2. For any medical intervention due to potential heat illness for military or civilian employees, the healthcare provider will contact public health to initiate AF Form 190, Occupational Illness/Injury Investigation Report. Occupational illness and injuries will be determined and reported according to AFI 91-204, *Safety Investigations and Reports*; HQ AFMOA/SGOP Memo, *Air Force Reportable Surveillance System Reporting*, 25 January 1997 (available at <http://wwwsam.brooks.af.mil/eh/files/policy/afress.doc>); and the Tri-Service Reportable Events Guidelines and Case Definitions. Summary information from all AF Forms 190 will be reported to HQ AETC/SGPB quarterly as part of the occupational health program metrics. For AETC units, *all* heat illnesses requiring medical intervention will be reported.

7.3. For personnel who become ill and are returned to duty during the hot season, a clinical provider will recommend whether or not additional restrictions are required to prevent heat stress disorders. The clinical provider will annotate these recommendations and any other restrictions or modifications to the individual's physical training and outdoor activities on AF Form 422.

8. Local Supplements. Each AETC installation will develop a supplement to this instruction and provide a copy to HQ AETC/SGPB. At a minimum, the local supplement must:

8.1. Identify who measures the WBGT index, where the measurements will be performed, and when and how often they will be taken.

8.2. Establish procedures to document WBGT measurements for later retrieval.

8.3. Establish notification procedures to ensure all base units (such as training squadrons, base gym, etc.) know when the WBGT heat conditions are reached or change. The preferred method should include flag posting; however, any other method may be used at the discretion of the wing commander. For bases where WBGT stage flags are used, the local supplement to this instruction will establish flag-posting locations and procedures.

8.4. Establish local policy on training activities that may and may not be conducted during each heat condition. Consider operational risk management (ORM) when developing local supplements to establish unit policies.

8.5. Identify unique training situations that warrant direct medical support and the details of the required support.

8.6. Establish procedures to evaluate trends in heat-related illnesses.

8.7. Describe procedures for medical notification of course supervisors of any trainees at increased risk of heat stress disorder due to illness or medication.

9. Waivers. Any increase in activity above the requirements of Table 1 will increase the risk of heat

stress disorders. Waivers will be considered when the additional risk is determined to be acceptable based on the reality of the training mission needs. The authority to grant a waiver to the work and rest cycles for training environments is the AETC Director of Operations (HQ AETC/DO) in consult with the AETC Command Surgeon (HQ AETC/SG).

9.1. Initial Waivers for Current Training Activities. Units presently conducting training exceeding the work limitations contained in Table 1 must submit a waiver request within 1 month of the publication of this instruction. Until a decision regarding their waiver is provided, these units may continue to operate under the previous version of this instruction and any existing, locally developed guidance for curtailment and termination of training in hot environments. Submit waiver request through the appropriate wing commander to HQ AETC/DO.

9.2. Waivers for Future Training Activities. Submit waiver requests as part of the course development process. Do not begin training before receiving an approved waiver from HQ AETC/DO.

9.3. Content of Waiver Requests. Each waiver request must contain the following minimum information:

9.3.1. Training Objective. Identify the required training elements from the appropriate plan of instruction.

9.3.2. Activity Description. Completely describe the trainee activities to include pace, load, duration, and required intensity over time.

9.3.3. Impact to Training. Explain the resulting training deficiency if held to Table 1 limitations.

9.3.4. Anticipated Training Environment. Explain the WBGT conditions in which the activity may be performed.

9.3.5. Alternatives Considered. Describe other options considered and reasons why training cannot occur. For example, explain why course activities cannot be moved to an earlier time of day to lessen the heat category.

9.3.6. Historical Heat Disorder Data. Provide all available historical data related to heat stress disorders experienced by trainees in specific activities and/or courses.

9.3.7. Additional Precautionary Measures. Describe all additional methods employed for the activity or course to mitigate the effects of heat illness or respond to the range of heat stress disorders.

9.4. Term of Validity of Waivers:

9.4.1. HQ AETC/DO will establish (in writing) the term of validity of waivers. At a minimum, requesters must renew waivers when this publication is revised.

9.4.2. Units conducting training under a waiver will annually submit to HQ AETC/DO the type and number of heat stress disorders resulting from activities conducted under the authority of a waiver to this instruction.

DANIEL DEGRACIA, Colonel, USAF, MSC
Deputy Command Surgeon

1 Attachment

Glossary of References and Supporting Information

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFMAN 32-4005, *Personnel Protection and Attack Action*
AFPD 48-1, *Aerospace Medical Program*
AFI 48-123, *Medical Examinations and Standards*
AFI 48-145, *Occupational Health Program*
AFI 91-204, *Safety Investigations and Reports*
AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program*
AETCI 11-405, *Flying Training Supervision*
Documentation of Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)
Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)

Abbreviations and Acronyms

ACGIH—American Conference of Governmental Industrial Hygienists
AETC—Air Education and Training Command
BE—bioenvironmental engineering
BG—black globe
DB—dry bulb
FITS—Fighter Index of Thermal Stress
lb—pound
mph—miles per hour
NWB—natural wet bulb
OL—operating location
ORM—operational risk management
PC—physical conditioning
TLV—threshold limit values
WBGT—wet bulb, globe temperature

Terms

Acclimatization—A period of adjustment an individual's body requires to become accustomed to working in hot environments. Full acclimatization occurs through progressive degrees of heat exposure and physical exertion. Personnel may need 2 weeks of increasing exposures to become substantially acclimated and may retain most of their adaptation for about 1 week after leaving a hot climate. Workers in good physical condition acclimate more quickly.

Fighter Index of Thermal Stress (FITS)—A guideline to predict cockpit environmental conditions during low-level missions which may jeopardize aircrew performance. The FITS is based on the dry air and the dew point temperatures. The FITS is primarily applicable to aircrew members wearing the lightweight flight suit in older fighter aircraft, both single and dual seats, with high-visibility bubble canopies.

Heat Stress—Heat stress is the combination of environment and physical work factors that constitute the total heat load imposed on the body. The environmental heat stress factors are air temperature, radiant heat exchange (example, sunlight), air movement, and relative humidity. Physical work contributes to total heat stress through the body's production of heat (metabolic heat) as it burns energy to sustain the work. This production of metabolic heat depends on the intensity of the physical effort that is affected, in turn, by body size, muscular development, physical fitness, and age.

Heat Stress Disorders—Heat stress disorders or heat disorders are general terms used to indicate any type of adverse health problem related to heat. Heat syncope, cramps, exhaustion, and stroke are all forms of heat stress disorders. Heat disorders may be recognized by one or more of the following symptoms: nausea, vomiting, fever, dizziness, headache, faintness, abnormal sweating, convulsions, lack of coordination, mental confusion, and abdominal or leg cramps. The personnel most likely to be affected by the heat are those who have just arrived from cooler regions of the country, are obese, or are in poor condition. A list of heat stress disorders follows:

Heat Cramps—Painful intermittent spasms of the muscles used during work (arms, legs, or abdominal) may occur during or after work hours. Cramps may result from exposure to high temperature for a relatively long time, particularly if accompanied by hard physical work. Cramps usually occur in unacclimatized personnel after heavy sweating and are the result of excessive loss of salt from the body. Even if the moisture is replaced by drinking water, the loss of salt by sweating may provoke heat cramps.

Heat Exhaustion—The signs of heat exhaustion are profuse sweating, weakness, rapid pulse, dizziness, nausea, and headache. The body temperature is elevated with heat exhaustion, although not to the same degree as with heat stroke. Heat exhaustion is caused by a deficiency of water and/or salt intake and circulatory strain from competing demands for blood flow to the skin and to active muscles. Can progress to heat stroke rapidly if not treated immediately.

Heat Stroke—Heat stroke is a medical emergency and is caused by exposure to a hot environment in which the body is unable to cool itself sufficiently. This results in the body temperature rising rapidly. With classic heat stroke, hot dry skin may be present. This should be anticipated in older or debilitated individuals. With exertional heat stroke, sweating continues. It is often preceded by nausea or vomiting, abnormal shivering, and/or confused mental status with slurred speech. In highly motivated individuals, the only sign before collapse and unconsciousness may be heavy sweating. Increased body temperature, if uncontrolled, may lead to delirium, convulsions, coma, and even death. Heat stroke is a much more serious condition than either heat cramps or heat exhaustion.

Heat Syncope—Fainting that occurs immediately after exertion without proper cool down or while standing erect and immobile in heat. Caused by pooling of the blood in dilated vessels and the lower parts of the body.

Hyponatremia (Acute Water Intoxication)—Condition in which the level of sodium in the blood is markedly lowered as a result of sodium lost in sweat, coupled with fluid replacement using only large volumes of plain water (greater than 1 1/2 quarts per hour). This is a medical emergency. Hyponatremia is a life-threatening condition that may result in confusion, fatigue, muscle cramps, and nausea early on, followed later by vomiting, unconsciousness, seizures, and death if not recognized and treated promptly. This condition is difficult to distinguish from heat exhaustion and

heat stroke, and if suspected should be treated immediately in a medical facility.

Wet Bulb, Globe Temperature (WBGT) Index—The WBGT index is a combination of temperature measurements that factor dry air temperature, air movement, relative humidity, and radiant heating. The equation for the WBGT index uses dry bulb (DB), natural wet bulb (NWB), and black globe (BG) temperatures.