

**BY ORDER OF THE
SECRETARY OF THE AIR FORCE**

**DEPARTMENT OF THE AIR FORCE
INSTRUCTION 48-151**



2 MAY 2022

Aerospace Medicine

THERMAL STRESS PROGRAM

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ACCESSIBILITY: Publications and forms are available on the e-Publishing website at www.e-Publishing.af.mil for downloading or ordering.

RELEASABILITY: There are no releasability restrictions on this publication.

OPR: AFMRA/SG3PB

Certified by: USAF/SG3/4
(Maj Gen Sharon R. Bannister)

Supersedes: AFI48-151, 7 April 2016

Pages: 30

This Department of the Air Force Instruction (DAFI) implements Air Force Policy Directive (AFPD) 48-1, *Aerospace & Operational Medicine Enterprise (AOME)*, and provides supporting guidance for establishing and implementing an effective local Thermal Stress Program to commanders, supervisors, medical personnel, and individuals at every level. This DAFI covers thermal stress education, environmental monitoring, and guidance charts. Signs and symptoms of thermal illness are provided in section 23.10 of Air Force Tactics, Techniques, and Procedures (AFTTP) 3-4, *Airman's Manual*. This publication applies to the entire Department of Air Force (DAF), including all civilian employees and uniformed members of the Regular Air Force, the Air Force Reserve, the Air National Guard, and the United State Space Force. This instruction does not apply to DAF units receiving thermal stress guidance from other military services under joint basing agreements. The lead service under the joint basing agreement will provide thermal stress support in accordance with their regulations and guidance. Ensure that all records generated as a result of processes prescribed in this publication adhere to AFI 33-322, *Records Management and Information Governance Program*, and are disposed of in accordance with the Air Force Records Disposition Schedule which is located in the Air Force Records Information Management System. Refer recommended changes and questions about this publication to the office of primary responsibility (OPR), AFMRA/SG3PB, using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate chain of command. This publication may be supplemented at any level, but all supplements must be routed to the OPR, AFMRA/SG3PB for coordination prior to certification and approval. The authorities to waive wing/Space Force equivalent/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See DAFI 33-360,

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SUMMARY OF CHANGES

This document has been substantially revised and must be completely reviewed. Major changes include updated roles and responsibilities, defined action levels, approved risk assessment methods, updated options for determining Wet Bulb Globe Temperature (WBGT) values based upon historical readings or an approved model, an updated Fighter Index of Thermal Stress (FITS) chart using dew point and dry bulb temperature, and updated definitions. Additionally, the term thermal injury was replaced with thermal illness to align with Title 29, Code of Federal Regulations (CFR) 1904.46 and Department of the Air Force Manual (DAFMAN) 91-224, *Ground Safety Investigation and Hazard Reporting* definitions. Lastly, the title changed from the Thermal Injury Prevention Program to the Thermal Stress Program.

Chapter 1—PROGRAM OVERVIEW	5
1.1. Purpose.	5
1.2. General.....	5
1.3. Keywords.....	5
Chapter 2—ROLES AND RESPONSIBILITIES	6
2.1. Assistant Secretary of the Air Force for Energy, Installations, and Environment (SAF/IE).	6
2.2. Deputy Assistant Secretary of the Air Force for Environment, Safety, and Infrastructure (SAF/IEE).	6
2.3. Air Force Surgeon General (AF/SG).....	6
2.4. Air Force Medical Readiness Agency, Aerospace Medicine Policy & Operations Division (AFMRA/SG3P).	6
2.5. Major Command Surgeon General (MAJCOM/SG).....	7
2.6. Installation Commander.....	7
2.7. Installation Environment, Safety and Occupational Health Council.	7
2.8. Medical Unit Commander.	7
2.9. Chief of Aerospace Medicine (SGP) or local equivalent.....	8

2.10.	Bioenvironmental Engineering Flight Commander or local equivalent.	8
2.11.	Public Health (PH) Flight Commander or local equivalent.	10
2.12.	Geographically Separated Unit Commander or Delegate (Medical Aid Station). ...	10
2.13.	Aerospace Physiology.	11
2.14.	USAFSAM.....	11
2.15.	Local Weather Flight (WF) or Detachment (Det) Commander or Reach-back Weather Unit.	11
2.16.	Base Civil Engineer (BCE).	12
2.17.	Installation/Unit Safety Office.	12
2.18.	Fitness Assessment Cell Manager.	12
2.19.	Mission Swimming Pool Managers.....	12
2.20.	Unit/Organizational Commander.	12
2.21.	Workplace Supervisor.	13
2.22.	Worker.....	13
Chapter 3—HEAT STRESS PROGRAM ELEMENTS		15
3.1.	Heat Illnesses.	15
3.2.	Critical Elements of a Heat-Related Illness Prevention Program.....	15
3.3.	Acclimatization Program.	15
3.4.	Training Program.	15
3.5.	Heat Alert Program.	16
3.6.	Medical Surveillance Program.	16
3.7.	Special Surveillance Environmental Monitoring.	16
3.8.	Heat Stress Guidelines.	17
Table 3.1.	Work/Rest Times & Fluid Replacement Guide, Technical Bulletin 507 (US Army, 2003).....	17
Table 3.2.	Modifications to WBGT for Body Armor/MOPP Gear Based Upon Workload.....	18
Chapter 4—THERMAL STRESS FOR AIRMEN/GUARDIANS IN FORMAL TRAINING COURSES AND PHYSICAL TRAINING		19
4.1.	Thermal Illness Prevention for Airmen/Guardians in Training.	19
4.2.	Unit Physical Training.	19
Figure 4.1.	WBGT Category Comparison Based Upon Heat Production Rate in Watts (W). ...	20
Table 4.1.	Recommended Cold Weather Thermal Illness Prevention.	21

Chapter 5—COLD STRESS PROGRAM ELEMENTS	22
5.1. Cold Illnesses.	22
5.2. Critical Elements of a Cold-Related Illness Prevention Program.	22
Figure 5.1. Wind Chill & Frostbite Time (National Weather Service, 2001).....	22
Table 5.1. Preventive Measures to Reduce Frostbite Risk, Technical Bulletin 508 (US Army, 2005).....	23
Chapter 6—FIGHTER INDEX OF THERMAL STRESS (FITS)	24
6.1. FITS.....	24
6.2. Assessing FITS Reference Values.....	24
6.3. FITS Tables Using Dew Point and Dry Bulb Temperature.	24
6.4. FITS Actions.	24
Table 6.1. Fighter Index of Thermal Stress Chart (°F).....	25
Attachment 1—GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION	27

Chapter 1

PROGRAM OVERVIEW

1.1. Purpose. This instruction establishes procedures and assigns responsibilities for executing the DAF Thermal Stress Program to prevent and manage thermal illness and optimize the safety and health of Department of Air Force (DAF) personnel.

1.2. General. This DAFI supports AFPD 48-1 and the requirement to optimize the safety and health of DAF personnel in the performance of their duties in any circumstance or location. This instruction is an aid in planning and safely executing industrial activities, mission operations, field exercises, training, community events, and other installation functions affected by heat or cold stress. Failure to comply with this instruction can have a significant impact on mission capability through degraded human performance and potentially result in the prolonged or permanent incapacitation or death of DAF military and civilian workers (Airmen and Guardians.)

1.3. Keywords. Thermal stress is the general term used for physiological stress experienced by the human body as a result of exposure to hot and cold environments resulting with heat stress and cold stress. Thermal stress may result in acute and chronic thermal illnesses. Thermal illnesses is the general term used for both heat illnesses and cold illnesses. See [Attachment 1](#), “Glossary of References and Supporting Information”, for additional terms, definitions, and references.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. Assistant Secretary of the Air Force for Energy, Installations, and Environment (SAF/IE).

2.1.1. Provides oversight of all matters pertaining to the formulation, review and execution of plans, policies, programs and budgets relative to the Air Force Thermal Stress Program.

2.1.2. Delegates DAF Thermal Stress Program responsibilities to the Deputy Assistant Secretary of the Air Force for Environment, Safety and Infrastructure.

2.2. Deputy Assistant Secretary of the Air Force for Environment, Safety, and Infrastructure (SAF/IEE). As delegated by the SAF/IE, provides policy, guidance, direction and oversight of all matters pertaining to the formulation, review and execution of plans, policies, programs and budgets relative to the DAF Thermal Stress Program. Oversees implementation of the program.

2.3. Air Force Surgeon General (AF/SG).

2.3.1. Provides strategic direction and develops policy to execute the DAF Thermal Stress Program.

2.3.2. Advocates for health risk assessment, surveillance and control requirements associated with DAF Thermal Stress Program through the medical and Line of the Air Force Planning, Programming, Budgeting and Execution System.

2.3.3. Reports the status of the DAF Thermal Stress Program on an as-requested basis to SAF/IE through a formal Program Management Review.

2.4. Air Force Medical Readiness Agency, Aerospace Medicine Policy & Operations Division (AFMRA/SG3P).

2.4.1. Assists AF/SG with developing policy to execute the DAF Thermal Stress Program.

2.4.2. Supports DAF Thermal Stress Program initiatives by validating requirements.

2.4.3. Plans, programs, and budgets for resources and provides oversight for execution of the DAF Thermal Stress Program through the office of Manpower, Personnel, and Resources (AF/SG1/8).

2.4.4. Develops and monitors DAF-level performance measures to assess DAF Thermal Stress Program effectiveness. Identifies metrics requiring Defense Occupational and Environmental Health Readiness System (DOEHRS) data quality report development to USAF School of Aerospace Medicine (USAFSAM) to meet metrics reporting requirements.

2.4.5. Reviews heat and cold illness risk reduction opportunities and makes recommendations to assist Line of the Air Force in executing effective resource prioritization.

2.4.6. Identifies and prioritizes DOEHRS technical and management issues related to heat and cold illness to the Department of Defense Industrial Hygiene Working Group or SAF/IEE or Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD (A&S)) for modification or other appropriate actions.

2.4.7. Establishes a Bioenvironmental Engineering equipment modernization and standardization process and ensures consistent utilization with respect to thermal stress equipment.

2.4.8. Approves predictive heat stress modeling tools for use by the career-field.

2.5. Major Command Surgeon General (MAJCOM/SG).

2.5.1. As needed, establishes DAF Thermal Stress Program medical support priorities and supplements to this DAFI to execute MAJCOM mission requirements.

2.5.2. Assists in the Air Force Planning, Programming, Budgeting and Execution process by identifying and advocating for any DAF Thermal Stress Program requirements.

2.5.3. Supports thermal hazard identification, control, mitigation, or elimination considerations in the Air Force operational capability requirements development process.

2.5.4. Ensures DAF Thermal Stress Program management performance monitoring across all bases within their command through the MAJCOM and installation Environment, Safety, and Occupational Health Councils.

2.5.5. Disseminates information pertaining to policy and new or pending legislation within MAJCOM as requested by AF/SG.

2.5.6. Coordinates with AFMRA/SG3P to identify and resolve DAF Thermal Stress Program programmatic issues.

2.6. Installation Commander.

2.6.1. Provides a safe and healthy workplace and community environment for all DAF military and civilian personnel in accordance with DoD and DAF Environment, Safety, and Occupational Health requirements as established in AFPD 90-8, *Environment, Safety & Occupational Health Management and Risk Management*. (T-0)

2.6.2. Implements and directs execution of the installation Thermal Stress Program through the installation Environment, Safety, and Occupational Health Council in accordance with AFI 90-801, *Environment, Safety, and Occupational Health Councils*. (T-1)

2.6.3. Ensures required Thermal Stress Program hazard controls are implemented and functioning correctly. (T- 3)

2.6.4. Ensures mechanisms for dissemination of thermal risk levels (flag codes) to assigned personnel. (T-1) This can include postings to organizational web sites, use of the commander's access channel, colored flags, signage, or other channels tailored to the installation and mission.

2.7. Installation Environment, Safety and Occupational Health Council. Provides senior leadership input, direction and management review of the installation Thermal Stress Program in accordance with AFI 90-801 and this DAFI. (T-1)

2.8. Medical Unit Commander. For Reg AF medical units, this is the Medical Treatment Facility (MTF) Commander, who is dual-hatted, and in that capacity, executes the duties, authorities, and responsibilities of both the MTF Director and the Service Commander. Air Reserve Component (ARC) equivalent is a Guard Medical Unit Commander (GMU/CC) and the Reserve Medical Unit Commander (RMU/CC) (or local equivalent).

2.8.1. Provides Thermal Stress Program support to the Wing (or local equivalent) and supported units including Geographically Separated Units and Munitions Support Squadron sites. (T-1)

2.8.2. Directs the installation Thermal Stress Program and ensures it is supported with adequate resources and staffing to implement the responsibilities outlined in this DAFI. (T-1)

2.8.3. Ensures timely care is provided for thermal-related illnesses. (T-1)

2.8.4. Ensures all medical staff who examine patients are aware of illnesses that may have a correlation to thermal stress. (T-1)

2.8.5. ARC Medical Unit Commanders (or local equivalent) provide ARC Thermal Stress Program support using organic capabilities or through a host-tenant support agreement as part of the Occupational and Environmental Health Program in accordance with AFI 48-145, *Occupational and Environmental Health Program*. (T-1)

2.9. Chief of Aerospace Medicine (SGP) or local equivalent.

2.9.1. Leads Aerospace Medicine execution of Thermal Stress Program responsibilities. (T-1)

2.9.2. Provides administrative and technical oversight of the Thermal Stress Program at supported Geographically Supported Units and Munitions Support Squadron sites. (T-1)

2.9.3. Provides medical oversight of the Thermal Stress Program and ensures medically appropriate risk assessment and medical surveillance activities are conducted. (T-1)

2.9.4. Trains MTF medical providers on potential thermal illnesses based on health risks associated with the installation and corresponding International Classification of Disease codes. (T-1)

2.9.5. Ensures providers make the final determination of an occupational illness on the illness report and officially notifies Public Health (PH) for inclusion in the Air Force Safety Automated System (AFSAS). (T-1)

2.9.6. As the Occupational and Environmental Health Working Group chair, annually reviews the Thermal Stress Program effectiveness under the direction of the Aerospace Medicine Council. The review shall include thermal illness trends and installation thermal risk communication procedures. (T-1)

2.10. Bioenvironmental Engineering Flight Commander or local equivalent.

2.10.1. Manages the Thermal Stress Program for the wing or installation commander. (T-3)

2.10.2. Assists commanders and supervisors with integrating thermal stress prevention information into risk management-based decision processes. (T-1)

2.10.3. Ensures thermal illness risk assessments are accomplished in accordance with AFI 48-145 and AFMAN 48-146, *Occupational & Environmental Health Program Management*. (T-1)

2.10.4. Plans and programs for resources to support the Thermal Stress Program. Specific resources the Bioenvironmental Engineering should purchase include (but not limited to) the current versions of the *American Conference of Governmental Industrial Hygienist (ACGIH®)*

Threshold Limit Value (TLV[®]) and Biological Exposure Indices (BEIs) and ACGIH[®]'s Documentation of the TLVs[®] and BEIs.

2.10.5. Conducts detailed workplace assessments of hot environments for thermal illness risk using the DAF accepted standard of the ACGIH[®] *Threshold Limit Values for Physical Agents (ACGIH[®] TLV[®]-PA)* found in AFMAN 48-146. **(T-0)** Uses the ACGIH[®] TLV[®]-PA as the occupational exposure limit for heat stress exposure assessments. **(T-0)** Prioritizes heat stress special surveillance in DOEHS. **(T-1)**

2.10.6. Conducts detailed workplace assessments of cold environments for thermal illness risk using the DAF accepted standard of the ACGIH[®] TLV[®]-PA found in AFMAN 48-146. **(T-1)** Uses the ACGIH[®] TLV[®]-PA as the occupational exposure limit for cold stress exposure assessments. **(T-1)** Prioritizes cold stress special surveillance in DOEHS. **(T-1)**

2.10.7. Reviews new processes or operations (garrison or deployed) to prevent or control potential thermal hazards at the earliest feasible stage. **(T-1)**

2.10.8. Determines the environmental contribution to thermal stress for the base population by either:

2.10.8.1. Using direct reading instruments to conduct thermal stress environmental monitoring at intervals designed to support mission requirements, **(T-3)** or

2.10.8.2. Estimating or modeling the environmental contribution to thermal stress. Uses historic WBGT logs/records to estimate conditions or uses current weather data in conjunction with an AFMRA approved model such as the Argonne National Laboratory WBGT calculator, https://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_4.html. **(T-3)** Coordinates with unit system administrator when installing this software on a network computer.

2.10.9. Employs mechanisms for dissemination of heat category (i.e., flag color) and frostbite risk levels to installation personnel. **(T-3)**

2.10.10. Investigates proposed changes to existing processes or operations, including equipment and facilities (including but not limited to construction plan reviews, the AF Form 332, *Base Civil Engineer Work Request*, or other base-specific process) for potential thermal hazards to DAF personnel. **(T-3)**

2.10.11. Effectively communicates thermal illness risks and recommends controls and/or corrective actions to organizational leadership, affected individual(s) and members of a related similar exposure group. **(T-1)**

2.10.12. When supporting a site with no Bioenvironmental Engineering personnel assigned, provides technical oversight for all thermal illness risk assessments at the Geographically Supported Units or Munitions Support Squadron sites. The level of involvement may range from simple oversight to performing the Occupational and Environmental Health assessments based on the technical expertise of the available personnel and the host-nation agreements for Outside Continental United States locations. **(T-2)**

2.10.13. Completes the workplace evaluation for occupational illness investigations and ensures the investigation is entered into the AF Safety Automated System. **(T-3)**

2.10.14. Documents reported thermal illnesses in the DOEHRS Incident Reporting Module. (T-1)

2.10.15. Completes deployment site-specific thermal stress exposure documentation in DOEHRS. (T-1)

2.10.16. Provides consultation, training and technical expertise to workplaces on thermal hazards and regulatory requirements when applicable. (T-1)

2.10.17. Provides consultation on thermal illness exposures to the Occupational and Environmental Health Working Group. Annually briefs installation thermal risk communication procedures to the working group. (T-1)

2.10.18. Serves as a member of the Heat Alert Working Group when established. (T-3)

2.11. Public Health (PH) Flight Commander or local equivalent.

2.11.1. Ensures thermal illnesses classified as reportable medical events are entered into the Air Force Disease Reporting System Internet in accordance with AFMAN 48-105, *Public Health Surveillance*. (T-0)

2.11.2. Ensures any thermal illness requiring more than first aid is investigated and recorded in the AFSAS. (T-1) Investigations shall be conducted in accordance with DAFMAN 91-224 and DAFI 91-204, *Safety Investigations and Reports* and be closed within 30 days. If the investigation cannot be completed within this 30-day period, PH will request an extension from the SGP and annotate the extension in AFSAS. (T-1)

2.11.3. Reviews each illness report in AFSAS after the provider makes the final occupational illness determination to ensure internal (within individual report) and external (compared with other similar illness reports) consistency and that all supporting data have been captured and documented. (T-1) Ensures the AF Form 190, *Occupational Illness/Injury Report* generated in AFSAS is filed in the patient's hard copy medical record or uploaded to the electronic medical record. (T-2)

2.11.4. Assists work area supervisors with accessing USAFSAM's thermal stress training materials. In coordination with Bioenvironmental Engineering, reviews the workplace-specific training materials. Ensures workplace supervisors are modifying standardized training material to include workplace and task specific details. (T-3)

2.11.5. Provides consultation on thermal illness exposures to the Occupational and Environmental Health Working Group. Annually briefs thermal illness trends to the working group. (T-1)

2.11.6. Serves as a member of the Heat Alert Working Group when established. (T-3)

2.12. Geographically Separated Unit Commander or Delegate (Medical Aid Station).

2.12.1. Ensures that Medical Aid Station staff provides Thermal Stress Program support as defined in this DAFI to the extent possible within the scope of training, manpower and equipment available. (T-3)

2.12.2. Ensures use of approved WBGT estimation calculator or obtains WBGT for use at Geographically Supported Units. (T-3)

2.12.3. Coordinates with the supporting MTF/SGP for Occupational and Environmental Health Program support as needed to fulfill the requirements of this DAFI. (T-3)

2.13. Aerospace Physiology.

2.13.1. Provides aircrew members training on thermal risk and prevention in accordance with AFMAN 11-403, *Aerospace Physiological Training Program*. (T-3)

2.13.2. At installations with clear “bubble” canopy aircraft (e.g., fighters and trainers), assesses the FITS as described in **Chapter 6** of this instruction. (T-3)

2.13.3. Disseminates the FITS to impacted units. (T-3)

2.14. USAFSAM.

2.14.1. USAFSAM Occupational and Environmental Health (USAFSAM/OE).

2.14.1.1. Provides technical consultation and detailed guidance (including information about models, climate data, and injury mechanisms) to assist in assessing and managing installation Thermal Stress Programs. (T-1)

2.14.1.2. Develops and maintains DAF thermal stress work-area specific training templates. This training must be readily available DAF-wide. (T-1)

2.14.1.3. Identifies thermal illness risk reduction opportunities with DAF-wide significance and evaluates costs/benefits. (T-1)

2.14.1.4. Analyzes DAF-wide, MAJCOM and installation thermal stress data in DOEHRS to identify significant trends, answer questions/requests and provide summary analyses to appropriate DAF and DoD authorities as requested. (T-1)

2.14.1.5. Develops DOEHRS data quality reports identified by AFMRA to meet metrics reporting requirements. (T-1)

2.14.1.6. Recommends DAF-level Thermal Stress Program metrics to AFMRA/SG3PB. (T-1)

2.14.2. USAFSAM Public Health (USAFSAM/PH).

2.14.2.1. Upon request, analyzes surveillance data (e.g., AF Disease Reporting System Internet) and other DAF-specific data (e.g., AF Safety Automated System) for thermal illness trends. (T-0)

2.14.2.2. Assists USAFSAM/OE in the development and maintenance of thermal stress training materials as requested. (T-3)

2.15. Local Weather Flight (WF) or Detachment (Det) Commander or Reach-back Weather Unit.

2.15.1. Supports the Thermal Stress Program with current weather data and information in accordance with local procedures. (T-3) **Note:**, At locations without an assigned WF/Det, end-users should submit a request for weather support to the 557th Weather Wing Directorate of Operations (557 WW/A3) to obtain required weather information in accordance with AFMAN 15-129, *Air and Space Weather Operations*.

2.15.2. Assists the Thermal Stress Program with obtaining and interpreting historical weather data and information, to include the local installation, future deployed locations, and other operational needs. (T-3)

2.15.3. Provides heat and cold weather advisories to the base populace to include weather watches, warnings and advisories as documented in applicable host/tenant support agreements. (T-2)

2.15.4. Serves as a member of the Heat Alert Working Group when established. (T-3)

2.16. Base Civil Engineer (BCE).

2.16.1. Establishes and maintains processes to ensure design and construction lead personnel involve Bioenvironmental Engineering in all design review stages (conceptual, intermediate and final), pre-construction meetings, pre-final and final inspections to identify and address potential thermal illness concerns related to new construction and facility modification projects. (T-3)

2.16.2. Serves as a member of the Heat Alert Working Group when established. (T-3)

2.17. Installation/Unit Safety Office.

2.17.1. Supports with training the unit and preventive medicine providers to produce a strategic, comprehensive set of heat illness prevention countermeasures.

2.17.2. Serves as a member of the Heat Alert Working Group when established. (T-3)

2.18. Fitness Assessment Cell Manager. Ensures environmental conditions are evaluated for thermal stress prior to implementing fitness assessments in accordance with DAFMAN 36-2905, *Air Force Physical Fitness Program* and **Chapter 4** of this instruction. (T-1)

2.19. Mission Swimming Pool Managers. Maintains mission swimming pool temperature in accordance with AFMAN 48-114, *Recreational Waters and Mission Training Pools* to reduce thermal stress during mission training operations. (T-1)

2.20. Unit/Organizational Commander.

2.20.1. Provides workers a safe and healthy work environment that complies with all Occupational and Environmental Health program requirements identified in AFI 48-145 and AFMAN 48-146, including thermal illness prevention captured in this AFI. (T-0)

2.20.2. Incorporates weather conditions, personal protective equipment (PPE)/clothing, and anticipated workload into planning for new operations, changes to existing processes or operations, equipment and facilities in coordination with Bioenvironmental Engineering. (T-1)

2.20.3. Supports installation and organizational level Thermal Stress Program objectives and targets. (T-3)

2.20.4. Implements corrective actions for identified Thermal Stress Program discrepancies to organizational facilities and processes. (T-1)

2.20.5. Ensures unit personnel are trained on the Thermal Stress Program as described in **paragraph 3.4** and **paragraph 5.2** of this DAFI. (T-3)

2.20.6. Recognizes the impact of thermal stressors and acclimatization on operations, exercises, training events, ceremonies, and other installation functions, and makes appropriate adjustments and accommodations. (T-3) Examples include:

2.20.6.1. Adjustment of work/rest cycles.

2.20.6.2. Provision of replacement fluids and electrolytes.

2.20.6.3. Provision of suitable personal protective equipment, gear, supplies, and DAF approved devices to include heart-rate monitors and wearable physiological sensor technology devices; and modifications as required to reduce risk in light of operational requirements such as immersion ice baths, etc.

2.21. Workplace Supervisor. All workplace supervisors responsible for operations in environments where there is a reasonable likelihood of heat or cold illness shall:

2.21.1. Ensure all Airmen and Guardians comply with applicable Thermal Stress Program regulatory and policy requirements. (T-3)

2.21.2. Ensure thermal stress hazards are abated to the maximum extent possible. (T-3)

2.21.3. Monitor for signs of heat and cold-related illness regardless of the heat category or frostbite risk level. (T-3)

2.21.4. Allow new workers to acclimatize to reduce the risk of thermal illness. Consults Bioenvironmental Engineering for assistance developing an acclimatization plan. (T-1)

2.21.5. Ensure required Thermal Stress Program hazard controls are implemented and functioning correctly, that PPE is available and used correctly in the workplace, and instruct personnel on care/hygiene of their PPE. (T-3)

2.21.6. Inform Bioenvironmental Engineering of proposed changes to workplace equipment, practices and/or procedures that may impact exposure to thermal hazards. (T-1)

2.21.7. Conduct workplace-specific thermal hazard training according to [paragraph 3.4.2](#) and [paragraph 5.2.1](#) of this DAFI; document training in accordance with AFI 91-202, *The US Air Force Mishap Prevention Program*. (T-0)

2.21.8. Develop thermal stress work-area specific training using USAFSAM's template. Consult PH if assistance is required to develop the work-area specific training. (T-2)

2.21.9. Notify PH of any occupationally-related thermal illnesses in accordance with AFI 48-145 and AFI 91-202. (T-1)

2.22. Worker. All DAF personnel who work in environments where there is a reasonable likelihood of heat or cold illness shall:

2.22.1. Understand the thermal risk aspects of work performed and complies with all risk mitigation strategies and program requirements, including training, work practices and the proper use, maintenance and storage of PPE. (T-3)

2.22.2. Report changes that may impact exposure to thermal hazards to the appropriate supervisor; actively participate in workplace health hazard identification and health risk assessments, to include wearing sampling/monitoring equipment. (T-3)

2.22.3. Report any occupationally related thermal illnesses to workplace supervisor in accordance with AFI 48-145 and AFI 91-202. (T-1)

Chapter 3

HEAT STRESS PROGRAM ELEMENTS

3.1. Heat Illnesses. Heat illnesses are interrelated and include some degree of elevated body temperature which may be complicated by deficits of body water. Heat illnesses include heat stroke, heat syncope, heat exhaustion, heat cramps, hyponatremia, heat rash, rhabdomyolysis, and other similar type issues.

3.2. Critical Elements of a Heat-Related Illness Prevention Program. According to National Institute for Occupational Safety and Health (NIOSH), *Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments*, there are four critical elements of a heat-related illness prevention program: (1) Acclimatization Program; (2) Training Program; (3) Heat Alert Program and (4) Medical Monitoring Program. Furthermore, and from a Joint Force Health Protection warfighting perspective, commanders at all levels employ these critical elements in preparation for and during Chemical, Biological, Radiological, and Nuclear (CBRN) operations that require personnel to wear Mission Oriented Protective Posture (MOPP) and Individual Protective Equipment. In effect, these combined elements are a critical enabling capability that support overarching CBRN survivability and mission continuation. Furthermore, more details regarding thermal stress while wearing MOPP is documented in Air Force Tactics, Techniques and Procedures (AFTTP) 3-2.46, *Multi-Service Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Passive Defense*.

3.3. Acclimatization Program. An effective acclimatization program will reduce the impact heat stress will have on the core body temperature of the worker. NIOSH recommends gradually acclimating the worker to his or her new environment by increasing the time of exposure each day over a 7 to 14 day period. The time to acclimatize varies by worker based on individual risk factors. Workplace supervisors shall consult Bioenvironmental Engineering for assistance developing an acclimatization plan. (T-3) Bioenvironmental Engineering may refer to NIOSH's *Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments* when assisting supervisors to develop acclimatization plans. Additionally, adequate hydration following heat exposure is required for acclimatization, equal to or greater than volume of sweat lost. It is known that a physically fit individual will acclimatize in half the time of a worker who is not physically fit. Also, acclimatized workers who are not exposed to heat stress for a week or more will need to re-acclimatize to the hot environment, typically completed in two or three days.

3.4. Training Program.

3.4.1. A heat stress training program ensures supervisors and workers are prepared to work safely in hot environments.

3.4.2. Employee Heat Stress Training. Employee training shall include information about acclimatizing, proper hydrating/fluid intake, recognizing and reporting heat-related illness symptoms, giving appropriate first aid, proper care and use of heat-protective clothing, added heat load caused by exertion/clothing/personal protective equipment, other factors that affect heat tolerance (e.g., medications, alcohol, obesity, relevant health conditions such as sickle cell trait status, etc.), and how to ensure weather data (i.e., WBGT) is part of the process for making work/rest cycle decisions. (T-1)

3.5. Heat Alert Program. While the Air Force publicizes the Summer Safety focus period from Memorial Day through Labor Day and this provides a general awareness to the base population regarding safety hazards during this time of year, a Heat Alert Program is recommended per NIOSH to prepare the workforce for the upcoming inclement weather season. Installations in warmer climates shall establish a cross functional Heat Alert Working Group (i.e., Bioenvironmental Engineering, Public Health, Safety, Maintenance, Civil Engineering, Weather, Public Affairs and Medical personnel, etc.) with the intent of preparing the base to both minimize the impact of heat stress to as low as reasonably achievable and to remind personnel on how to recognize and respond to heat-stress related issues. **(T-3)** This committee may be included in already occurring Safety programs for efficiency purposes and to reduce duplicative efforts. Bases should use weather advisories to communicate when a heat alert is likely to occur. The weather advisories shall be broadcast to the base to ensure the population is aware of the hazard and take appropriate actions. **(T-3)**

3.6. Medical Surveillance Program. Workplace supervisors will track workers exposed above the ACGIH® action limit in a hot environment. Workers exposed for more than 30 days per year shall be presented to the Occupational and Environmental Health Working Group for medical surveillance consideration. **(T-3)** Workers exposed above the ACGIH® action limit in a hot environment for more than 30 days per year shall be presented to the Occupational and Environmental Health Working Group for medical surveillance consideration. **(T-3)** Bioenvironmental Engineering shall identify shops with Similar Exposure Groups who meet this criteria and document in DOEHRS. **(T-0)** This data will be presented and reviewed during the Occupational and Environmental Health Working Group meeting. **(T-3)** Medical surveillance may include preplacement and periodic medical evaluations to include comprehensive work and medical history, physical examination, assessment of medication, supplements, alcohol, or caffeine use, assessment of obesity, and assessment of personal protective equipment as determined appropriate by the Occupational and Environmental Health Working Group.

3.7. Special Surveillance Environmental Monitoring. ACGIH® uses metabolic heat of the worker and WBGT to assess heat-related illness risk. WBGT monitoring may be conducted to support both individual workplace and base population risk assessments.

3.7.1. WBGT. The WBGT is currently the industry standard according to NIOSH and ACGIH® for predicting the risk of thermal illness. Detailed analysis of the influence of the environment on thermal stress requires knowledge of the following four basic parameters: air temperature, mean radiant temperature, air speed and absolute humidity. The WBGT combines the measurement of two derived parameters, natural wet-bulb temperature (T_{nwb}) and the black globe temperature (T_g), and, in some situations, the measurement of the basic parameter, dry-bulb (air) temperature (T_{db}). During periods of hot weather, the WBGT is determined and the appropriate Heat Stress Risk and Flag Color can be determined using [Table 3.1](#) The WBGT formulae can utilize either °F or °C, as long as usage is consistent; the equations are as follows:

$$3.7.1.1. \text{ WBGT} = 0.7(T_{nwb}) + 0.2(T_g) + 0.1(T_{db}) \text{ (outdoors)}$$

$$3.7.1.2. \text{ WBGT} = 0.7(T_{nwb}) + 0.3(T_g) \text{ (with no radiant load)}$$

3.7.2. Special Assessment Environmental Monitoring. WBGT monitoring shall be conducted in individual work centers to support detailed risk assessments in accordance with the *American Conference of Governmental Industrial Hygienist Threshold Limit Values®* for Heat Stress and Strain. **(T-1)**

3.7.3. Installation Environmental Monitoring. WBGT monitoring for the base population shall be accomplished periodically to mark the transition from one thermal illness risk stage to another at intervals designed to support mission requirements. (T-1) The data collected shall be compared to reference values in Table 3.1 to determine flag conditions and communicated as appropriate. (T-1) Alternatively, approved modeling tools shall be used in accordance with paragraph 2.10.8.2 of this DAFI including the Argonne National Laboratory WBGT calculator (Liljegen). (T-3)

3.8. Heat Stress Guidelines. Table 3.1 provides workload, heat categories, WBGT temperature ranges, flag colors, recommended work/rest cycles and water intake for easy, moderate, and hard work.

Table 3.1. Work/Rest Times & Fluid Replacement Guide, Technical Bulletin 507 (US Army, 2003).

Heat Category	WBGT Index (°F)	Easy Work (250 W) Weapon maintenance, marksmanship training, drill and ceremony		Moderate Work (425 W) Patrolling with 30 lb load, low and high crawl, dig defensive position		Heavy Work (600 W) Patrolling with 45 lb load, four-person litter carry (180 lbs), jogging 4 mph		Very Heavy Work (800 W) Two-person litter carry (150 lbs), move under direct fire, obstacle course	
		Work/Rest (minutes)	Fluid Intake (quarts/hour)	Work/Rest (minutes)	Fluid Intake (quarts/hour)	Work/Rest (minutes)	Fluid Intake (quarts/hour)	Work/Rest (minutes)	Fluid Intake (quarts/hour)
1	78-81.9	NL	1/2	NL	3/4	40/20 (110)*	3/4	20/40 (45)*	1 (3/4)*
2 (GREEN)	82-84.9	NL	1/2	NL	3/4 (1)*	30/30 (70)*	1	15/45 (40)*	1
3 (YELLOW)	85-87.9	NL	3/4	NL	3/4 (1)*	30/30 (60)*	1	10/50 (25)*	1
4 (RED)	88-89.9	NL	3/4	50/10 (180)*	3/4 (1 1/4)*	20/40 (50)*	1 (1 1/4)*	10/50 (20)*	1 (1 1/4)*
5 (BLACK)	> 90	NL	1	20/40 (70)*	1 (1 1/2)*	15/45 (45)*	1 (1 1/2)*	10/50 (20)*	1 (1 1/2)*
NL = No limit to work time per hour		*Use the amounts in parentheses for continuous work when rest breaks are not possible. Leaders should ensure several hours of rest and rehydration time after continuous work.				CAUTION: Hourly fluid intake should not exceed 1.25 quarts. Daily fluid intake should not exceed 12 quarts.			
¹ This guidance will sustain performance and hydration for at least 4 hours of work in the specified heat category. ² Fluid needs can vary based on individual differences (+/-0.25 qt/hr) and exposure to full sun or full shade (+/-0.25 qt/hr). ³ Rest means minimal physical activity (sitting or standing) in the shade if possible. ⁴ Body Armor - Add 5°F to WBGT index in humid climates. ⁵ NBC (MOPP 4) - Add 10°F (Easy Work) or 20°F (Moderate or Hard Work) to WBGT index.									

3.8.1. Modifications to the WBGT for clothing. Normal duty-type uniforms, overalls, and long-sleeved civilian work clothes do not drive any adjustment to the WBGT.

3.8.2. Wearing a second layer of clothing, such as chemical protective gear (MOPP gear) or firefighting bunker gear adds 10°F to the WBGT measurement for light work, and 20°F for moderate to hard work. A summary of modifications to WBGT for clothing is in Table 3.2.

3.8.3. The addition of PPE can or will increase the thermal illness risk to the worker. Additionally, wear of body armor adds an additional 5°F to the WBGT measurement.

Table 3.2. Modifications to WBGT for Body Armor/MOPP Gear Based Upon Workload.

	Addition to WBGT (°F)		
	Easy Work	Moderate Work	Hard Work
Normal Duty-Type Uniforms (OCP/ABU, Overalls or Long-Sleeved Work Clothes)	0	0	0
Body Armor	5	5	5
Second Layer of Clothing or MOPP Gear	10	20	20
Total Maximum Addition to WBGT Based Upon Work-Rate and PPE	15	25	25

Chapter 4

THERMAL STRESS FOR AIRMEN/GUARDIANS IN FORMAL TRAINING COURSES AND PHYSICAL TRAINING

4.1. Thermal Illness Prevention for Airmen/Guardians in Training. Thermal illness prevention, particularly heat illness prevention, is a high priority for Basic Military Training, and in the preparation and training of Special Warfare and Security Forces Airmen. In order to overcome the inherent training restrictions created by exclusively following the work/rest cycle, the training unit will work in partnership with unit safety and preventive medicine providers to produce a strategic, comprehensive set of heat illness prevention countermeasures. **(T-1)**

4.1.1. Heat and cold illness prevention will be targeted to the unique needs of each training objective/course, and will be taught and integrated into risk management aspects of each training objective/course. **(T-1)**

4.1.2. A defined risk management matrix will be developed for each high-risk training event in the training unit. **(T-1)** This approach provides a level of heat and cold illness prevention that exceeds the work/rest cycle while assuring training standards and mission goals are accomplished.

4.1.3. Thermal illness prevention elements of the risk management matrix will be reviewed and approved by preventive medicine providers upon initial development and re-reviewed in the event of any heat illnesses. **(T-1)**

4.2. Unit Physical Training. Commanders and unit physical training leaders (PTLs) shall consider thermal flag conditions for warmer temperatures and wind chill and precipitation for colder temperatures to determine when and how to train the unit. **(T-1)** The general recommendation is unit physical training be conducted when the environmental stressors are at a minimum, typically in the early morning during the summer timeframe and afternoons during the winter timeframe.

4.2.1. Unit physical training leaders shall take into account the activity planned, work/rest cycles and available water sources prior to the activity. **(T-1)** Depending on how strenuous the training, unit physical training leaders shall apply the work/rest cycles and fluid replacement guidelines from **Table 3.1** appropriately. **(T-1)** Unit physical training shall not occur during Black Flag conditions in **Figure 4.1** **(T-3)**

4.2.2. It is important to note, the heat category (flag condition) and work-rest cycles referenced in **Table 3.1** are intended for a worker at a work-site. They are not applicable to certain high intensity sports or unit physical training activities. Some high intensity events may result in metabolic heat production rates well above 800 watts exceeding the definition of very hard work in **Table 3.1** Two common examples include a 5-mile run in <40 minutes and a 12-mile march with 55 pounds completed in <180 minutes. One way to mitigate risk is to apply sports medicine heat stress categories during high intensity physical training events. Both military and sports medicine heat categories use the same color scheme, but sports medicine assigns flag conditions at lower temperatures to account for higher metabolic heat production during competitive athletic events. Sports medicine heat categories are summarized in **Figure 4.1** Unit physical training leaders shall use the sports medicine flag conditions for high intensity sports in **Figure 4.1** when planning high intensity physical activities. **(T-3)**

- 4.2.2.1. Low Caution: Low health risk for normal activities in these temperature ranges.
- 4.2.2.2. Modify Activity: Moderate health risk for activities in these temperature ranges. Consider limiting activity or require breaks and adequate hydration.
- 4.2.2.3. High Caution: High health risk for activities in these temperature ranges. Activities should be modified and ensure members have adequate hydration.
- 4.2.2.4. Suspend Activity: Severe health risk for activities at or above these temperature ranges. Activities should be suspended.

Figure 4.1. WBGT Category Comparison Based Upon Heat Production Rate in Watts (W).

Standard Military Recommendations		Sports Medicine High Intensity Sports Recommendations (Cheuvront & Hosokawa)	
Heat Production Rate			
Lower Temperatures	300 – 800 W & Work/Rest Cycles	> 800 W Continuous	
	White (78-81.9°F)	White (<50°F)	
Low Caution	Green (82-84.9°F)	Green (50-64.4°F)	Low Caution
Modify Activity	Yellow (85-87.9°F)	Yellow (64.5-73.4°F)	Modify Activity
High Caution	Red (88 – 89.0°F)	Red (73.5 – 82.4°F)	High caution
Suspend Activity	Black (≥90°F)	Black (>82.4°F)	Suspend Activity
Higher Temperatures			

4.2.3. Preventing cold weather health issues can be managed by understanding the hazards and the techniques to mitigate the risks. Hazards include air temperatures below 40 °F, wetness, wind, and lack of shelter/rewarming. Additionally, there are personal risk factors that include

hydration, nutrition, previous cold injuries, tobacco and/or alcohol use, low activity, and sleep deprivation.

4.2.3.1. Heat dissipates when exposed to cold temperature and when coupled with wind, heat is dissipated even quicker. Higher winds increases how fast heat is dissipated. A lower wind chill can increase the rate at which certain cold-weather health issues can develop (i.e., frostbite and hypothermia). Therefore, wind chill needs to be factored for determining outside training decisions during colder temperatures.

4.2.3.2. PTLs must be aware of precautions for conducting training outside in extreme weather, such as wearing proper clothing and using appropriate equipment. **(T-3) Figure 5.1 (Chapter 5)** provides the wind chill temperature as well as the time it could take to develop frostbite.

4.2.3.3. Cold weather thermal illness prevention recommendations are provided in **Table 4.1** These recommendations must be coupled with adequate protection from the weather and be based on the wind-chill temperature.

Table 4.1. Recommended Cold Weather Thermal Illness Prevention.

Wind-Chill Temperature (°F)	Recommended Action
≤30	Awareness of potential cold injury
≤ 25	Provide/wear additional protective clothing
≤ 15	Modify activity to allow more frequent opportunities to re-warm; 1 hour outside with 20 minutes of rewarm
≤ 0	Cancel Activity

4.2.4. Fitness Assessments.

4.2.4.1. Acclimatization for physical fitness purposes can take much longer than the typical 7-14 days for a worker to acclimatize to a new work-site. Acclimatization for physical fitness purposes will be done in accordance with DAFMAN 36-2905. **(T-1)**

4.2.4.2. WBGT must be within allowable parameters in accordance with DAFMAN 36-2905 prior to the start of the walk/run test. **(T-1)** Fitness assessments include periods of work and rest between exercises and will result in metabolic heat production rates below 800 watts thereby not meeting the definition of high intensity sports. The flag conditions for high intensity sports in **Figure 4.1** are not appropriate for fitness assessments.

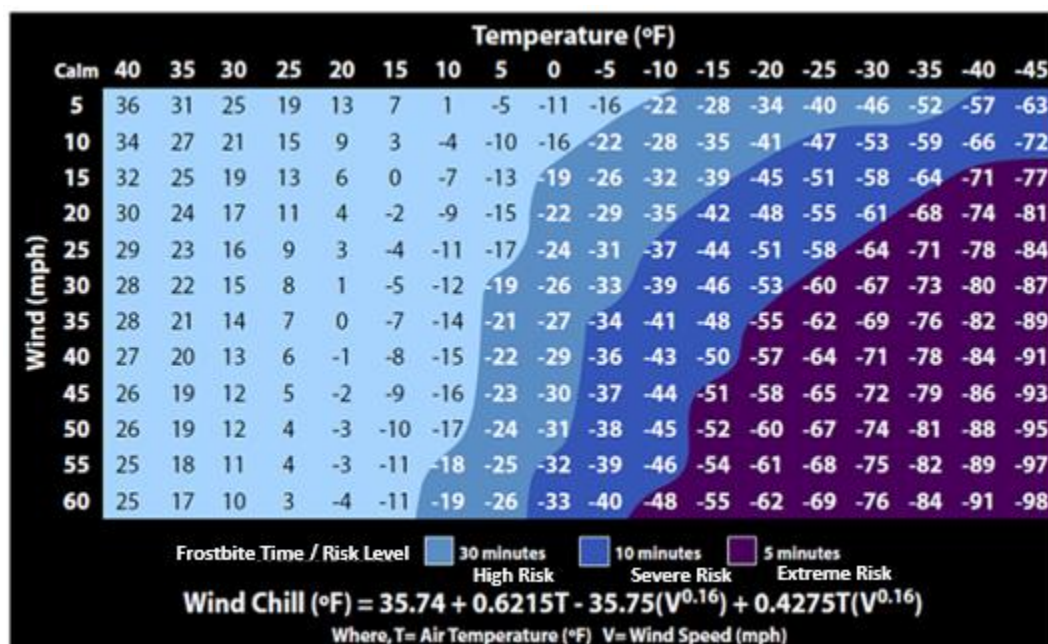
Chapter 5

COLD STRESS PROGRAM ELEMENTS

5.1. Cold Illnesses. Cold illnesses can be broken down into three categories: cold/dry freezing illnesses (frostbite), cold/wet non-freezing illnesses (trench foot and chilblains) and hypothermia.

5.2. Critical Elements of a Cold-Related Illness Prevention Program. To prevent cold-weather injuries, engineering and administrative controls will be implemented at work-centers, personal-protective equipment/clothing requirements will be issued to minimize skin contact with freezing temperatures, and work-rest cycles will be based upon the frostbite risk obtained from [Figure 5.1](#) and the prevention guidelines in [Table 5.1 \(T-1\)](#)

Figure 5.1. Wind Chill & Frostbite Time (National Weather Service, 2001).



5.2.1. Employee Cold Stress Training. Employee training shall include information about risk factors that contribute to cold stress, recognizing and reporting cold-related illness symptoms, giving appropriate first aid, general methods to prevent cold stress, and how to use weather data (i.e., frostbite risk level) to make specific risk mitigation decisions using [Figure 5.1](#) and [Table 5.1 \(T-1\)](#)

5.2.2. Conditions at the actual worksite. It is important to keep in mind that the actual environmental work conditions may vary significantly from where the weather data is collected. If workers are on the flight-line exposed to propeller/rotor-generated wind the conditions could be much more severe. Additionally, if a Geographically Supported Unit is at a significantly higher altitude than where the weather station is located then one must as a general rule decrease the air temperature 3.6°F for every 1,000 feet increase in altitude. Additionally, frostbite illnesses occur at differing temperatures based upon whether or not the skin is dry (~28°F) or wet (~30°F). Lastly, if the ambient air temperature is >32°F there is no risk of frostbite despite the wind-speed.

Table 5.1. Preventive Measures to Reduce Frostbite Risk, Technical Bulletin 508 (US Army, 2005).

Frostbite Risk Level	Preventive Measures
Low Risk	<ul style="list-style-type: none"> • Recommended work/rest (W/R) cycle: 50 minutes work/10 minutes warming • Increase surveillance with self and buddy checks • Wear appropriate layers and wind protection for the work intensity • Cover exposed flesh if possible • Wear Vapor Barrier (VB) boots below 0°F • Provide warming facilities below 20 °F • Avoid sweating.
High Risk <i>Frostbite time = 30 mins</i>	<ul style="list-style-type: none"> • Recommended W/R cycle: 40 minutes work/20 minutes warming • Mandatory buddy checks every 20–30 minutes • Wear appropriate layers & All Purpose Environmental Clothing System (APECS) • Protect head, face and hands • Cover exposed flesh • Wear VB boots below 0 °F • Provide warming facilities • Avoid sweating
Severe Risk <i>Frostbite time = 10 mins</i>	<ul style="list-style-type: none"> • Recommended W/R cycle: 30 minutes work/30 minutes warming • Mandatory buddy checks every 10 minutes • Wear appropriate layers and APECS or cold weather parka • Protect head, face and hands • Wear VB boots • Provide warming facilities • Work groups of no less than two personnel • No exposed skin • Stay active • Avoid sweating
Extreme Risk <i>Frostbite time = 5 mins</i>	<ul style="list-style-type: none"> • Mission critical work only due to extreme risk • Keep task duration as short as possible • Wear appropriate layers, cold weather parka, wind protection • Protect head, face and hands • Wear VB boots • Provide warming facilities • Work groups of no less than two personnel • No exposed skin • Stay active • Avoid sweating

Chapter 6

FIGHTER INDEX OF THERMAL STRESS (FITS)

6.1. FITS. The FITS was developed in 1979 (Nunnley and Stribley) to provide a measure of the thermal stress experienced by aircrew in high performance aircraft with canopies and environmental control systems, engaged in combat sorties at low altitudes, in direct sunlight or light overcast, and in elevated outside ambient temperatures. The FITS table uses ground dry bulb temperature and dew point to yield an estimate of cockpit thermal stress.

6.2. Assessing FITS Reference Values. In hot environments, the FITS provides a measure of thermal stress which can be used to determine risk of aircrew heat illness. The calculated values assume an Aircrew Equipment Assembly of 1.5-2.0 clothing and thermal insulation (clo) value, roughly equivalent to light, summer Aircrew Equipment Assembly; therefore, the FITS is not appropriate for cold weather, immersion suit or other types of individual protective equipment with higher clo values.

6.3. FITS Tables Using Dew Point and Dry Bulb Temperature. The FITS Table 6.1 utilize dew point and the dry-bulb temperature (T_{db}) to determine the appropriate risk category.

6.4. FITS Actions. FITS reference values and their associated zones are not exact demarcations, but represent the temperatures and humidity at which aircrews begin to experience heat-stress-related effects. These effects may vary with the individual, the particulars of the ground and flight aspects of the mission, the particular clothing worn, and so forth. The following FITS action, therefore, are guides, rather than directives.

6.4.1. FITS Normal Zone (Green). The Normal Zone is subjectively hot, but normally safe, and generally covers FITS Reference Values under 90 °F. The following procedures shall be implemented:

6.4.1.1. Be alert for symptoms of heat stress. (T-3)

6.4.1.2. Ensure adequate fluid intake. (T-3)

6.4.2. FITS Caution Zone (Yellow). The Caution Zone includes conditions that are tolerable if adequate precautions are taken, and generally covers FITS Reference Values between 90 °F and 99 °F. The following procedures shall be implemented:

6.4.2.1. Be alert for symptoms of heat stress. (T-3)

6.4.2.2. Drink plenty of non-caffeinated fluids. (T-3)

6.4.2.3. Avoid exercise 4 hours prior to take off. (T-3)

6.4.2.4. Limit ground operations time outside an air-conditioned environment to 90 minutes.

Table 6.1. Fighter Index of Thermal Stress Chart (°F).

		Dry Bulb Temperature (°F)																		
		80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116
Dewpoint (°F)	10	N/A	N/A	N/A	N/A	N/A	82	83	84	86	87	88	90	91	92	94	95	96	98	99
	12	N/A	N/A	N/A	N/A	N/A	82	83	85	86	87	89	90	91	93	94	95	96	98	99
	14	N/A	N/A	N/A	N/A	N/A	82	83	85	86	87	89	90	91	93	94	95	97	98	99
	16	N/A	N/A	N/A	N/A	N/A	82	84	85	86	88	89	90	92	93	94	96	97	98	99
	18	N/A	N/A	N/A	N/A	N/A	83	84	85	87	88	89	91	92	93	95	96	97	98	100
	20	N/A	N/A	N/A	N/A	N/A	83	84	85	87	88	90	91	92	93	95	96	97	99	100
	22	76	77	79	80	82	83	84	86	87	88	90	91	92	94	95	96	98	99	100
	24	76	78	79	81	82	83	85	86	87	88	90	91	93	94	95	97	98	99	100
	26	77	78	80	81	82	84	85	86	87	88	90	92	93	94	96	97	98	99	101
	28	77	79	80	81	83	84	85	87	88	89	91	92	93	95	96	97	98	99	101
	30	77	79	80	81	83	84	85	87	88	89	91	92	94	95	96	97	98	99	101
	32	78	79	80	81	83	84	85	87	88	89	91	92	94	95	96	97	98	99	101
	34	79	80	81	82	83	85	86	87	88	90	91	93	94	95	96	98	99	100	102
	36	79	80	82	82	84	86	87	87	89	90	92	93	95	96	97	98	99	100	102
	38	80	81	82	83	84	86	87	88	89	91	92	94	95	96	97	99	100	101	103
	40	81	82	83	83	85	87	88	89	90	92	93	94	95	97	98	99	100	101	103
	42	81	82	83	84	85	87	88	89	91	92	93	95	96	97	98	100	101	102	104
	44	82	83	84	85	86	88	89	90	91	93	94	95	96	98	99	100	101	103	104
	46	82	84	84	85	87	88	90	91	92	93	95	96	97	98	99	100	102	103	104
	48	83	84	85	86	87	89	90	91	93	94	95	96	97	99	100	101	102	104	105
	50	84	84	85	87	88	90	91	92	93	94	96	97	98	99	100	101	103	104	105
	52	84	85	87	88	90	91	92	93	94	95	96	98	99	100	101	102	103	105	106
	54	84	86	88	89	90	91	92	93	95	96	97	98	99	101	102	102	104	106	107
	56	85	87	89	90	91	92	93	94	95	96	97	99	100	101	102	103	104	106	107
	58	86	88	90	90	91	92	93	94	96	97	98	100	101	102	103	104	105	107	108
	60	87	89	90	91	92	93	94	95	97	98	99	101	102	103	104	105	106	107	108
	62	88	89	91	92	93	94	95	96	97	99	100	101	102	103	104	105	106	108	109
	64	89	90	91	93	94	95	96	97	98	100	101	102	103	104	105	106	107	108	109
	66	90	91	93	94	95	96	97	98	99	100	101	103	104	105	106	107	108	109	110
	68	91	92	94	95	96	97	98	99	100	101	102	103	104	106	107	108	109	110	111
70	92	93	95	96	97	98	99	100	101	102	103	104	105	106	108	109	109	110	112	
72	93	94	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	113	
74	94	95	97	98	99	100	101	102	103	104	105	106	107	109	110	111	112	112	114	
76	95	96	98	99	100	102	102	103	104	105	106	108	109	110	111	112	113	114	115	
78	97	98	99	100	101	103	104	105	106	107	108	109	110	111	112	113	114	115	116	
80	98	100	100	101	102	104	105	106	107	108	109	110	111	112	113	114	115	116	117	
82	99	100	101	102	103	105	106	107	108	109	110	111	112	113	114	115	116	117	118	
84	101	102	101	103	104	106	107	108	109	110	111	112	113	114	115	116	117	118	119	
86	102	103	104	104	106	108	108	109	110	111	112	113	114	115	116	117	118	119	120	
88	103	104	105	106	107	109	109	110	111	112	113	114	115	116	117	118	120	121	121	
90	105	106	107	108	109	110	110	111	112	113	113	114	115	117	118	119	120	122	123	

6.4.3. FITS Danger Zone (Red). The Danger Zone represents conditions that induce progressive heat storage and dehydration sufficient to affect crew performance during normal low-level missions, and comprise FITS Reference Values over 100 °F. When the FITS Reference Value is over 115 °F, consider limiting or cancelling non-essential flight operations, as the thermal stress constitutes a serious drain on physiological reserves. The following procedures shall be implemented:

- 6.4.3.1. Minimum recovery time is two hours (landing time to next take off). (T-3)

- 6.4.3.2. Limit ground operations time outside air-conditioned environment to 45 minutes. (T-3)
- 6.4.3.3. If possible, wait in a cool shaded area if the aircraft is not ready to fly. (T-3)
- 6.4.3.4. Complete a maximum of two aircraft inspections, two exterior inspections on initial sorties, and one exterior inspection on subsequent sorties for fighters and trainers.
- 6.4.3.5. Undergraduate Flying Training solo students should be limited to one exterior aircraft inspection per sortie.

ROBERT I. MILLER
Lieutenant General, USAF, MC, SFS
Surgeon General

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

- 10 USC 9013, *United States Code, Title 10 – Armed Forces, Subtitle D – Air Force, Section 9013 – Secretary of the Air Force*, 29 March 2022
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Adopted Forms

AF Form 190, *Occupational Illness/Injury Report*

AF Form 332, *Base Civil Engineer Work Request*

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

ACGIH®—American Conference of Governmental Industrial Hygienists

AF—Air Force

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFMRA—Air Force Medical Readiness Agency

AFPD—Air Force Policy Directive

AFTTP—Air Force Tactics, Techniques, and Procedures

APECS—All Purpose Environmental Clothing System

AFSAS—Air Force Safety Automated System

ARC—Air Reserve Component

BCE—Base Civil Engineer

BEI—Biological Exposure Index

CBRN—Chemical, Biological, Radiological and Nuclear

clo—Clothing and Thermal Insulation Value

DAF—Department of the Air Force

Det—Detachment

DOEHRS—Defense Occupational and Environmental Health Readiness System

FITS—Fighter Index of Thermal Stress

FR—Federal Register

GMU—Guard Medical Unit

MAJCOM—Major Command

MOPP—Mission Oriented Protective Posture

MTF—Medical Treatment Facility

NIOSH—National Institute for Occupational Safety and Health

PPE—Personal Protective Equipment

PH—Public Health

PTL—Physical Training Leader

RMU—Reserve Medical Unit

SORN—System of Record Notice

TLV®—Threshold Limit Value®

US—United States

USAF—United States Air Force

USAFSAM—USAF School of Aerospace Medicine

VB—Vapor Barrier

WBGT—Wet Bulb Globe Temperature

W—Watts

WF—Weather Flight

W/R—Work/Rest

Terms

Acclimatization—Acclimatization is the physiological adaptation of an individual to changes in climate or environment, such as temperature, humidity, or altitude.

Black Globe Temperature (T_g)—Is a measurement that integrates radiant (or direct sunlight) heat exchange and convective heating or cooling into one value. The WBGT index is based on the response of the six inch diameter globe. This measurement uses a six inch diameter hollow copper sphere painted matte black on the outside and containing an unshielded dry-bulb thermometer in the center of the sphere. **Note:**, some current meters use a smaller sphere that is correlated to a six inch sphere.

Cold Illness—Acute and chronic illnesses including cold/dry freezing illnesses (frostbite), cold/wet non-freezing illnesses (trench foot and chilblains) and hypothermia. For the purpose of AFSAS reporting, when greater than first aid is rendered the above cold illnesses will be reported as occupational illnesses not injuries.

Cold Stress—Environmental and/or personal conditions that tend to remove body heat and decrease body temperature.

Dry—Bulb (air) Temperature (T_a)—Is the temperature measured with an ordinary alcohol-in glass, or mercury-in-glass thermometer whose bulb is kept dry and shielded from direct sun radiation.

First Aid—Any initial one-time treatment and any follow-up visit for observation of minor thermal illness that does not ordinarily require care. Such one-time treatment and follow-up visit for observation is considered first aid, even though provided by a physician or medical professional. First aid as defined in 29 CFR 1904.7 includes use of non-prescription medicine at non-prescription strength; drinking fluids for relief of heat stress; cleaning, flushing or soaking wounds on the surface of the skin; or using hot or cold therapy. Treatment outside this list is considered medical treatment greater than first aid. See 29 CFR 1904 and DAFI 91-204 for further guidance on illness classifications.

Heat Illness—Traditionally heat illness has been divided into heat exhaustion and (exertional) heat stroke. In practice the division is difficult to define; thus, for the purpose of this DAFI the term ‘Heat Illness’ is all encompassing and applies to an individual who collapses as the result of a rise in core body temperature. For the purpose of AFSAS reporting, when greater than first aid is rendered the following will be reported as occupational illnesses not injuries: dehydration, heat exhaustion, heat syncope, heat stroke, heat cramps, rhabdomyolysis or other similar type issues.

Heat Stress—The net heat load to which an Airman/Guardian is exposed from the combined contributions of heat generated in the body (metabolic heat), environmental factors, and clothing worn which results in an increase in heat storage in the body.

Humidity—An expression of the quantity of water vapor mixed with the other atmospheric gases.

Natural Wet—Bulb Temperature (T_{nwb})—Is the temperature measured with a thermometer, with a wet wick fitted closely over the bulb or electronic sensor.

Thermal Illness—General term referencing acute and chronic heat and cold illnesses.

Thermal Stress—The physiological stress experienced by the human body as a result of exposure to hot and cold environments. Thermal stress includes both heat stress and cold stress.

Wet-Bulb Globe Temperature (WBGT)—Is an empirical index of heat that provides an index that corresponds to the behavior of the human body under heat strain.