REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
03-08-2021	Final	

4. TITLE AND SUBTITLE
Test Operations Procedure (TOP) 07-3-529A
Ingress, Emergency Egress, and Emergency Evacuation Testing of Army Aircraft

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHORS

5d. PROJECT NUMBER
ATEC Project No. 2020-DT-RTC-TOPRO-H7739

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Redstone Test Center
Aviation Flight Test Directorate
Building 4880 Hale Road
Redstone Arsenal, Alabama 35898

8. PERFORMING ORGANIZATION REPORT NUMBER
TOP 07-3-529A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Policy and Standardization Division (CSTE-CI-P)
U.S. Army Test and Evaluation Command
6617 Aberdeen Boulevard
Aberdeen Proving Ground, MD 21005-5001

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Distribution Statement A. Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES
Defense Technical Information Center (DTIC), AD No.:
This TOP supersedes TOP 07-3-529, dated 30 September 1991.

Marginal notations are not used in this revision to identify changes, with respect to the previous issue, due to the extent of the changes.

14. ABSTRACT
This Test Operations Procedure (TOP) specifies procedures for testing ingress, emergency egress, and emergency evacuation from U.S. Army aircraft. Components installed on the interior and exterior of the aircraft as well as personnel equipment may adversely affect ingress and emergency egress/evacuation from an aircraft. The inherent design of a particular aircraft may also contribute to the time required to egress safely depending on the number of crew doors and exits designated as emergency routes.

15. SUBJECT TERMS

ingress; emergency egress; emergency evacuation; human factors engineering; rotary-wing; fixed-wing; aircraft

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**B. ABSTRACT**	**C. THIS PAGE**			**19b. TELEPHONE NUMBER** *(include area code)*
Unclassified	Unclassified	Unclassified	SAR	31	

(This page is intentionally blank.)

US ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

*Test Operations Procedure 07-3-529A 3 August 2021
DTIC AD No.

INGRESS, EMERGENCY EGRESS, AND EMERGENCY EVACUATION TESTING OF ARMY AIRCRAFT

* This TOP supersedes TOP 07-3-529, Ingress, Emergency Egress, and Emergency Evacuation Testing of Army Aircraft, dated 30 September 1991.

---

1. SCOPE.

This Test Operations Procedure (TOP) specifies procedures for testing ingress, emergency egress, and emergency evacuation from U.S. Army aircraft. Components installed on the interior and exterior of the aircraft as well as individually-issued equipment (e.g., rucksacks, body armor, weapons) may adversely affect ingress and emergency egress/evacuation from an aircraft. The inherent design of a particular aircraft may also contribute to the time required to egress safely depending on the number of crew doors and exits designated as emergency routes. The design standards in Appendix A provide guidelines for ingress, emergency egress, and emergency evacuation. The checklist in Appendix B provides a list of items to coordinate for ingress and emergency egress/evacuation testing.

2. FACILITIES AND INSTRUMENTATION.

2.1 Facilities.

Item	Requirement
Aircraft hangar or airfield ramp space	Adequate space must be provided for ingress and emergency egress/evacuation trials. All potential trip hazards within 10 feet (ft) of the aircraft must be eliminated.
Bullhorn, flags, lights, or hand signals	Test participants must be able to respond to audible or visual cues as indicated by data collection personnel.
Tape (duct, painters, etc.)	Used to mark 5-ft demarcation line from each aircraft entrance/exit used.
Maintenance stand/platform	The maintenance stand/platform must be capable of elevating data collection personnel to a height that will afford visual access from outside the aircraft. Maintenance stands or platforms may be used for ingress and emergency egress/evacuation testing to prevent personnel injury provided test integrity is not compromised.
Cushioned area	The cushions must prevent or minimize the potential for injury to test participants as a result of jumping from heights above 4 ft.

2.2 Instrumentation.

Measurement Devices	Permissible Measurement Uncertainty
Stopwatch	Accurate to 0.1 second.
Photographic equipment: a. Still frame digital camera b. Video recording system	All photographic equipment must be able to capture all critical body maneuvers under various environmental conditions, i.e., day/night. Video playback including freeze frame and slow motion capability.
Anthropometric kit: a. Anthropometer b. Sliding caliper c. Spreading caliper d. Scale	Height, weight, and various physical dimensions of test participants will be rounded to the nearest 0.1 centimeter (cm) and 0.1 pound, respectively.
Tape measure	Accuracy must be within 0.1 cm or 1/8th of an inch.

3. TEST CONDITIONS.

3.1 Aircraft.

3.1.1 The aircraft configuration to be tested shall be that which most closely resembles an operational configuration of that particular type of aircraft in the areas impacted by ingress and emergency egress/evacuation. All crewmember seats, passenger seats, and mission equipment shall be installed to reflect the appropriate mission function. Seats must be equipped with appropriate safety belts and harnesses.

3.1.2 Interior access may be required to allow data collection personnel to observe ingress and emergency egress/evacuation maneuvers from within the aircraft if their presence does not affect the test.

3.1.3 Exits and entrances shall be selected in accordance with criteria defined in TR 89-D-22E Vol. V[1**]. For emergency egress and emergency evacuation testing, half of the designated aircraft emergency exits shall be used. Crewmembers and passengers must be able to exit the aircraft before post-crash conditions (i.e., fire, smoke, fumes, water) incapacitate the crewmember/passenger, even if half of the exits are blocked. For aircraft with an odd number of designated emergency exits, half of the exits rounded up to the next whole number will be blocked (e.g., aircraft has five emergency exits, three exits will be blocked).

** Superscript numbers correspond to those in Appendix I, References.

3.2 Support Requirements.

Logistical support will be required to assist and ensure that required aircraft, facilities, instrumentation, and test personnel are provided. Scheduling the required number of test participants will depend on the extent of tests conducted and type of aircraft used.

3.3 Test Personnel.

3.3.1 Representative personnel, as close as reasonably possible to the 5th percentile female to the 95th percentile male population[2], should be used for testing. To simulate a worst-case scenario, the largest available personnel should be used for ingress, emergency egress, and emergency evacuation trials.

3.3.2 Adequate personnel should be provided to serve as passengers, data collectors, equipment operators, and safety officers. Participants used in ingress and emergency egress/evacuation trials from the cockpit and flight crewmember stations should be familiar with the type of aircraft used. Participants performing as passengers in emergency evacuation trials should be familiarized with the emergency egress requirements (e.g., receive passenger briefing) but not apply knowledge from previous operational experience.

3.4 Uniform Configuration.

The Army has a wide variety of uniform configurations for varying mission scenarios. Uniforms selected for ingress and emergency egress/evacuation testing should contain a realistic sampling, which will address the most extreme operational conditions for flight crewmembers and passengers. A worst-case configuration may comprise severe cold weather or chemical, biological, radiological, and nuclear (CBRN) protective clothing. The potential impact of individually-issued equipment should be considered when conducting ingress, emergency egress, and emergency evacuation trials. The list in Appendix C presents elements of the various combinations that can be worn to represent actual combat clothing ensembles. The ingress/emergency egress/emergency evacuation data sheet (Appendix D) may be used to detail uniform configurations used during testing.

4. TEST PROCEDURES.

4.1 General.

Ingress and emergency egress/evacuation testing are conducted to determine compliance with design standards specified in Appendix A. The procedures for each test are similar in approach and methodology with the exception of the various configurations of clothing, aircraft, and exits used.

4.1.1 Aircraft Inspection.

Prior to testing, ingress and emergency egress/evacuation passageways shall be examined to ensure that requisite latches, handles, handholds, emergency lighting, and associated labeling are

in place, functional, and are not obstructed. If problems are noted, the appropriate maintenance personnel should repair the item(s) prior to testing. If unable to be repaired, the discrepancy should be annotated.

4.1.2 Site Preparation.

Photography and videography equipment must be set up in the optimum position to capture the chain of events without impact to testing. A demarcation line shall be marked 5 ft from all exits used during the test. Cushioning pads may be required on the ground outside the aircraft to prevent injury to participants when conducting emergency egress/evacuation trials. Data collection equipment shall be positioned in the least obtrusive location so as not to impede or influence the test results.

4.1.3 Orientation.

Prior to each test, a briefing session will be conducted with all test personnel to explain the test objectives and to standardize audio and/or visual cueing. The test participants will not know which aircraft exit they will use until the signal is given at the start of the test.

4.1.4 Non-Destructive Testing.

During actual emergency egress/evacuation, many emergency exits are designed to be jettisoned with no regard to materiel damage. Such materiel damage is often unacceptable during emergency egress/evacuation testing. In such cases, timed removal of select doors, windows, and/or hatches will occur separate from timed personnel egress in order to prevent damage. Removal of aircraft doors/windows/hatches should be conducted under the worst-case test condition (e.g., 1st percentile female wearing bulkiest mission clothing ensemble). If possible, at least three removals of each exit being used for the trial should be timed either before or after personnel egress testing. Timing should encompass actuating the release and fully removing the door/window/hatch for a clear exit. The average time required to remove the applicable door/window/hatch will be added to the overall emergency egress/evacuation time to account for not having to remove these during the actual timed events. The use of averages in this process is not intended to apply statistical significance to the testing, but rather account for minor variations in the multi-step process for jettisoning an exit. Non-destructive jettisoning demonstrations of doors/windows/hatches may require additional mitigations to prevent damage to the subject materiel.

4.2 Ingress.

4.2.1 General.

Ingress tests are conducted to determine compliance with design standards specified in Appendix A. Although there is no time requirement for ingress, time may be used to determine if there are issues with the aircraft configuration or test article. The mission of the test aircraft should be considered when determining impacts of ingress times.

4.2.2 Procedure.

Ingress trials will begin with the test participants standing at the 5-ft demarcation line outside of the aircraft. Upon being given a start signal by test personnel, test participants will open the required doors, enter the aircraft, close the doors, proceed to their crew position and fasten themselves into the seat. Test participants for crewmember positions will connect all communications and mission equipment as necessary, put hands and feet on the flight controls or crew station weapon/controls as required, and give a sign of completion (i.e., thumbs-up, verbal, or other pre-briefed cue) at which the timing will stop. See Appendix B for a checklist that illustrates the required parameters of the test(s). At least three trials should be conducted for each test condition.

4.3 Emergency Egress.

4.3.1 General.

Emergency egress tests are conducted with crewmembers to determine compliance with design standards specified in Appendix A. Test participants representing crewmembers should be familiar with the test aircraft (paragraph 3.3.2). Emergency egress is conducted with half of the designated emergency exits blocked (paragraph 3.1.3). To prevent aircraft damage, applicable exits may be removed prior to timed emergency egress trials (paragraph 4.1.4) and average removal time added to overall emergency egress time. Deviations from design standards will require further analysis to determine the exact nature of the problem and what corrective action will be required. Emergency egress testing is intended to assess the characteristics associated with exiting the aircraft following a determination that emergency egress is required and the command is given.

4.3.2 Procedure.

Emergency egress trials begin with the test participant seated in the crewmember seat within the aircraft and their restraint system (i.e., seat belt, harness, tether) fastened. All mission equipment (i.e., communication and electrical system cables, helmet-mounted display or night vision system cables) and other personal devices shall be connected, and hands and feet shall be on the flight controls. Upon being given a pre-briefed signal by test personnel, the test participant will attempt to egress the aircraft as quickly as possible through the designated passageways. This will be done by unfastening only the seat belt (restraint system), opening the applicable exit, and departing the aircraft. When the 5-ft demarcation line is crossed, timing of the maneuver will be terminated. See Appendix B for a checklist that illustrates the required parameters of the test. A minimum of three trials are to be conducted for each test condition. Following the completion of trials, crewmembers will make subjective judgements of the ability to reach and open exits for emergency egress from an aircraft that is inverted or on its side.

4.3.3 Data Considerations.

Time to complete emergency egress should include all actions required by the crewmembers to exit the aircraft. Restraint harness release and emergency exit operation design standards listed

in the following paragraphs should be examined. Additionally, design standards for emergency exit size, location, markings, and lighting should be reviewed. Further guidance can be found in Appendix A.

a. Emergency Egress Time. Exits of sufficient size and number shall be provided in the aircraft so that, if some of them are blocked due to the post-crash position of the aircraft, the maximum number of personnel to be carried may be evacuated within 30 seconds[3]. All occupants must be able to evacuate the aircraft within 10 seconds. The allowable evacuation time can be extended to 30 seconds if a crash resistant fuel system is installed in the aircraft[1]. Emergency escape provisions should allow the maximum number of aircraft personnel to evacuate in 30 seconds with only one-half of the aircraft exits available for egress[1].

b. Seat/Restraint Release Operation. Personnel restraint harnesses (1) are comfortable and light in weight; (2) easy to put on and remove; (3) contain a single-point release system which is easy to operate with either hand and is protected from inadvertent release; (4) provide freedom of movement to operate the controls of the aircraft[4]. Any additional tasks involving manual disconnection from aircraft-mounted equipment, restraints requiring two-hands to disconnect, or greater than 5 seconds to disconnect shall be considered unacceptable.

c. Emergency Exit Operation. Exit operation should be simple, obvious, and natural to all personnel expected to be aboard the aircraft. An emergency exit should be capable of being completely opened within 5 seconds, and only the single operation of pulling or pushing the exit closure into the clear should be necessary, once the release handle has been actuated[1].

4.4 Emergency Evacuation.

4.4.1 General.

Emergency evacuation tests, with a fully occupied aircraft, are conducted to determine compliance with design standards specified in Appendix A. Test participants representing passengers should not be intimately familiar with the test aircraft (paragraph 3.3.2). Emergency evacuation is conducted with half of the designated emergency exits blocked (paragraph 3.1.3) to determine if a sufficient size and number of exits are available in a post-crash scenario for all crewmembers and passengers to safely evacuate the aircraft. To prevent aircraft damage, applicable exit hatches/doors may be removed prior to timed emergency egress trials (paragraph 4.1.4) and average removal time added to overall emergency egress time. Deviations from design standards will require further analysis to determine the exact nature of the problem and what corrective action will be required.

4.4.2 Procedure.

Emergency evacuation trials begin with test participants representing a full contingent of crewmembers and passengers seated within the aircraft and their restraint system (i.e., seat belt, harness, tether) fastened. For crewmember positions, all mission equipment (i.e., communication and electrical system cables, helmet-mounted display, or night vision system cables) and other personal devices shall be connected, and hands and feet shall be on the flight

controls, if seated at a location with flight controls. Upon being given a pre-briefed signal by test personnel, the test participants will attempt to evacuate the aircraft as quickly as possible through the designated passageways. This will be done by unfastening only the seat belt (restraint system), opening the applicable exit, and departing the aircraft. When the 5 ft demarcation line is crossed, timing of the maneuver will be terminated. See Appendix B for a checklist that illustrates the required parameters of the test(s). It is recommended that at least three trials be conducted for each test condition. Following the completion of trials, crewmembers and passengers will make subjective judgements of the ability to reach and open exits for emergency evacuation from an aircraft that is inverted or on its side.

4.4.3 Data Considerations.

Time to complete emergency evacuation should include all actions required by the crewmembers and passengers to exit the aircraft. Restraint harness release and emergency exit operation design standards listed in paragraphs 4.3.3.b and 4.3.3c should be examined. Improvements in evacuation times resulting from increasing familiarity with the aircraft or equipment configuration should be considered. Additionally, design standards in the following paragraphs for emergency evacuation time, exit size, location, markings, and lighting should be reviewed. Further guidance can be found in Appendix A.

a. Emergency Evacuation Time. The evacuation times prescribed in Military Standard (MIL-STD)-1472D should be used as a guide when assessing emergency evacuation characteristics if no other specific time requirements are applicable. Emergency evacuation of all passengers and crew members shall be possible within 60 seconds, using only one-half of the exits[5].

b. Exit Size. All exits, including Class C exits (defined in Appendix G), must be large enough to accommodate 95th percentile troops and aviators must be large enough to allow these personnel to evacuate the aircraft rapidly at a rate of 1.5 seconds per person or less[1].

c. Exit Location. Exits intended for emergency use should be equally divided on each side of the aircraft, and if feasible, should not be directly opposite each other[1].

d. Exit Access. Access from aisles to all exits should be provided so that the exits will not be obstructed by troop seat components, seat back webbing and webbing support bars, litter installations, or other protrusions to an extent that would reduce the effectiveness of the exit[1].

e. Instruction Markings. Operating instructions to identify and explain emergency release operation should be marked on the exit door, or hatch, or aircraft structure, whichever is nearer the release; instructions should be as simple and concise as possible consistent with clarity of meaning, using standard English terminology, such as PULL, PUSH, TURN or SLIDE[1].

f. Lighting. Emergency lighting should provide sufficient illumination throughout the cockpit and cabin areas to permit occupants to locate emergency exits and survival equipment, perceive escape paths, and avoid obstacles while moving toward the exits[1]. Supplementary emergency lighting units should be provided at or near each emergency exit with adequate

brightness to permit untrained personnel to identify exits, to read exit operating instructions, and to actuate the exit mechanism without difficulty during periods of reduced visibility[1].

5. DATA REQUIRED.

Data collected will identify any problems associated with crewmember and passenger ingress, emergency egress, and emergency evacuation on a wide variety of fixed- and rotary-wing aircraft. Data collected for all tests will include the information listed in the data sheet in Appendix D. Appendix E includes any applicable or relevant anthropometric data to gather for test participants. A sample questionnaire is provided in Appendix F for test participant qualitative assessments. Any deviations or discrepancies regarding test aircraft configuration or test procedures shall be annotated.

6. PRESENTATION OF DATA.

Data collected will be compiled and presented in either tabular or narrative form as required by the test sponsor. Noncompliance with specific design standards will be discussed.

(This page is intentionally blank.)

APPENDIX A. DESIGN STANDARDS.

A.1. Emergency Exit Size.

a. TR 89-D-22E Vol. V[1] (paragraphs 7.2.1 and 7.2.3).

b. Federal Aviation Regulation (FAR), Part 25, Section 25.807[6]. Exit size requirements for FAR are detailed in Appendix G, Glossary.

A.2. Number of Emergency Exits Required.

a. TR 89-D-22 Vol. V[1] (paragraph 7.2.4).

b. FAR, Part 25, Section 25.807[6].

A.3. Emergency Exit Location: TR 89-D-22E Vol. V[1] (paragraph 7.2.5).

A.4. Emergency Exit and Latch Marking.

a. Exit Markings: TR 89-D-22E Vol. V[1] (paragraph 7.4).

b. Marking for Operation: TR 89-D-22E Vol. V[1] (paragraph 7.4.4).

A.5. Emergency Exit Operation.

a. TR 89-D-22E Vol. V[1] (paragraph 7.2.6).

b. Appropriate Aircraft Operator's Manual.

A.6. Handhold and Footholds: MIL-STD-1472G[7] (paragraph 5.7.7.8).

A.7. Latches: MIL-STD-1472G[7] (Appendix A, paragraph A.9).

A.8. Seat/Release Mechanism Operation.

a. Joint Service Specification Guide (JSSG)-2010-7[4] (paragraph 3.7.3.2).

b. MIL-STD-1290[3] (paragraph 5.2).

A.9. Emergency Lighting: TR89-D-22 Vol. V[1] (paragraph 7.3).

A.10. Emergency Evacuation Time: MIL-STD-1290[3] (paragraph 5.4).

(This page is intentionally blank.)

APPENDIX B. SAMPLE INGRESS/EMERGENCY EGRESS/EMERGENCY EVACUATION CHECKLIST.

Date:_____ Test:_____
Aircraft Type: _____ Aircraft Configuration:_____

Type Test Conducted (circle one): Ingress Emergency Egress Emergency Evacuation

PROCEDURES	CHECK WHEN COMPLETE
1. Uniform configurations have been determined.	
2. Number of trials for each test type and uniform configuration have been determined.	
3. Aircraft has been inspected and is ready for trial to begin; all designated exits are operable or removed as required.	
4. Area around aircraft has been cleared of obstructions. Demarcation line marked.	
5. Seats are properly prepared for each participant.	
6. Environmental conditions (e.g., day/night) have been annotated.	
7. Side of aircraft and passageways have been determined for the type of test to be conducted.	
8. Test participants have been briefed and the required number of passengers have been obtained.	
9. Photographic and data collection personnel positioned.	
10. Test participants positioned for start of test (line of demarcation or in applicable seat).	
11. Start cue initiated by data collectors.	
12a. Ingress trials commence when test participants cross demarcation line. Time stops when test participants give signal that ingress is complete.	
12b. Emergency egress trials commence when test participants give indication that they are secured in their seats with all applicable items connected. Time is stopped when test participants egress and cross the demarcation line.	
12c. Emergency evacuation trials commence when start signal is given and timing will stop when all test participants cross the demarcation line.	

(This page is intentionally blank.)

APPENDIX C. U.S. ARMY AVIATION UNIFORM COMPONENTS.

ENSEMBLE	COMBAT BASIC		SEVERE COLD, HIGH ALTITUDE		BASIC COMBAT OVERWATER MOPP[a] II		COMBAT MODERATE COLD OVER WATER		HOT/DRY MOPP IV	
Component Name	**Pilot**	**Crew**	**Pilot**	**Crew**	**Pilot**	**Crew**	**Pilot**	**Crew**	**Pilot**	**Crew**
Army Aircrew Combat Uniform, Jacket	X	X	X	X	-	-	-	-	-	-
Army Aircrew Combat Uniform, Trouser	X	X	X	X	-	-	-	-	-	-
Under layer 1 Top	X	X	X	X	X	X	-	-	-	-
Under layer 1 Bottom	X	X	X	X	X	X	X	X	X	X
Base Layer 2 Top	-	-	X	X	-	-	X	X	-	-
Base Layer 2 Drawers	-	-	X	X	-	-	X	X	-	-
Midweight Layer 3 Drawers	-	-	X	X	-	-	-	-	-	-
Intermediate Weather Outer Layer 6 Jacket	-	-	X	X	-	-	-	-	-	-
Intermediate Weather Outer Layer 6 Pants	-	-	X	X	-	-	-	-	-	-
Environmental Control Vest	-	-	-	-	-	-	X	X	X	X
Neck Gaiter	-	-	X	X	-	-	-	-	-	-
Joint Protective Aircrew Chemical Ensemble	-	-	-	-	X	X	-	-	X	X
Summer Flyers' Glove	X	X	-	-	X	X	-	-	X	X
Masley Cold Weather Glove	-	-	X	X	-	-	X	X	-	-
Socks, wool, standard issue	X	X	-	-	X	X	-	-	X	X
Layer 4 Cold Weather Socks	-	-	X	X	-	-	X	X	-	-
Army Combat Boots (Temperate Weather)	X	X	-	-	X	X	X	X	-	-
Intermediate Cold Wet Boots with Removable Liner	-	-	X	X	-	-	-	-	-	-
Army Combat Boots (Hot Weather)	-	-	-	-	-	-	-	-	X	X
Survival Vest (Primary Survival Gear Carrier and all associated Aviation Life Support Equipment)	X	X	X	X	X	X	X	X	X	X
Body Armor Carrier, Soft Armor Ballistic Inserts and Applicable Enhanced Small Arms Protective Inserts	X	X	X	X	X	X	X	X	X	X
Flight Helmet	X	X	X	X	X	X	X	X	X	X
Overwater Survival Components (oxygen bottle, regulator, and flotation)	-	-	-	-	X	X	X	X	-	-
High Altitude Survival Components (supplemental oxygen system)	-	-	X	X	-	-	-	-	-	-
Chemical, Biological and Radiological Survival Components (mask, hood filter assembly, gloves and over boots)	-	-	-	-	-	-	-	-	X	X

[a] MOPP - mission oriented protective posture

(This page is intentionally blank.)

APPENDIX D. SAMPLE INGRESS/EMERGENCY EGRESS/EMERGNCY EVACUATION DATA SHEET.

Date:_____
Type Test Conducted (circle one): Ingress Emergency Egress Emergency Evacuation
Aircraft Type:_____
Aircraft Configuration:_____

TABLE D-1. TEST PARTICIPANT INFORMATION

TEST PARTICIPANT IDENTIFIER	CREW POSITION	GRADE/RANK/MOS

TABLE D-2. CLOTHING/EQUIPMENT CONFIGURATION

ITEM	WORN (Y/N)	DESCRIPTION (size/part number/national stock number)
Flight Gear:		
Army Aircrew Combat Uniform		
Survival Vest		
Body Armor		
Gloves		
Helmet		
Flight Boots		
Mission Gear:		
CBRN Components		
Overwater Components		
High Altitude Components		

APPENDIX D. SAMPLE INGRESS/EMERGENCY EGRESS/EMERGNCY EVACUATION DATA SHEET.

TABLE D-3. EMERGENCY EGRESS DATA

TRIAL NUMBER	AIRCRAFT CONFIGURATION (exits available/exits blocked)	TEST CONDITION		TIME (seconds)
		Lighting (day/night)	Number of Crew/Passengers	

Additional Notes:

_____

_____

_____

_____

_____

_____

_____

APPENDIX E. PARTICIPANT DEMOGRAPHIC DATA.

Name: _____
Gender:_____
Aviator (circle one): Yes No
Handedness: Right Left Ambidextrous
Eyeglasses: N/A Near-sighted Far-Sighted

TABLE E-1. ANTHROPOMETRIC DATA

DIMENSION	MEASUREMENT (cm/kilogram)	PERCENTILE[a]
Weight		
Stature		
Acromial Height		
Hip Breadth (sitting)		
Shoulder Circumference		
Shoulder Breadth		
Buttock-Heel Length		
Sitting Height		
Chest Circumference		
Chest Depth		
Waist Circumference		
Head Circumference		
Face Length		
Face Width		
Thumb tip Reach		
Additional Measurement		

[a] Natick/TR-15/007[2]

(This page is intentionally blank.)

APPENDIX F. SAMPLE INGRESS/EMERGENCY EGRESS/EMERGENCY EVACUATION QUESTIONNAIRE.

Date:_____
Type Test Conducted (circle one): Ingress Emergency Egress Emergency Evacuation
Aircraft Type: _____
Participant Identifier: _____

1. Were the latch/door handles labeled to provide an indication for the direction required to open? Yes___ No___ N/A___
   If no, please describe the handle and location:

_____
_____
_____

2. Are latch/door handles turned in a consistent direction throughout the aircraft for similar type of passageways? Yes___ No___ N/A___
   If no, please describe the difficulty you encountered and the location of the passageway.

_____
_____
_____

3. Did you encounter any latch/door handles that you felt required excessive force to open? Yes___ No___ N/A___
   If yes, please describe problems and the location of the latch.

_____
_____
_____

4. Were handholds and footholds spaced close enough together to enable easy access to the aircraft? Yes___ No___ N/A___
   If no, please describe the nature of the difficulty and the location of the footholds and handholds.

_____
_____
_____

APPENDIX F. SAMPLE INGRESS/EMERGENCY EGRESS/EMERGENCY EVACUATION QUESTIONNAIRE.

5. Were handholds and footholds spaced close enough together to enable easy egress from the aircraft? Yes___ No___ N/A___

If no, please describe the nature of the difficulty and the location of the footholds and handholds.

_____
_____
_____

6. Were the emergency lighting systems adequate in illuminating egress locations under dark or low light conditions? Yes___ No___ N/A___

If no, please describe the difficulty you encountered and the location of the passageway.

_____
_____
_____

7. Were there any obstructions within the walkways which seriously impeded your egress from the aircraft? Yes___ No___ N/A___

If yes, please describe the difficulty and the location of the obstruction.

_____
_____
_____

8. Did you have serious difficulty egressing through any emergency evacuation exit? Yes___ No___ N/A___

If yes, please describe the difficulty and the location of the passageway.

_____
_____
_____

9. Did certain clothing configurations seriously impede your attempts to ingress or egress the aircraft? Yes___ No___ N/A___

If yes, please describe the clothing worn, the type of ingress or egress maneuver conducted, and the difficulties associated with this aircraft type.

_____
_____
_____

10. Please list any additional comments:

_____
_____
_____

APPENDIX G. GLOSSARY.

Term	Definition
Emergency Egress	The actions performed by a crewmember to quickly and safely egress the aircraft under emergency conditions.
Emergency Evacuation	The actions performed by all crewmembers and passengers (maximum available occupancy) to quickly and safely evacuate the aircraft under emergency conditions.
Emergency Evacuation Time	Refers to the time in minutes, seconds, and tenths of seconds for all crewmembers and a full complement of passengers in mission representative attire to release their restraint systems, exit through one-half of the available exits, and continue to the line of demarcation.
Ingress	The actions of the crew to enter the aircraft, position and secure themselves into their seats in preparation for takeoff.
Crash Resistant Fuel Tank	A tank which conforms to Military Detail (MIL-DTL)-27422F[8]
MIL-STD Class A Exit[1]	A door, hatch, canopy, or other exit closure intended primarily for normal entry and exit.
MIL-STD Class B Exit[1]	A door, hatch, or other exit closure intended primarily for service or logistic purposes (e.g., cargo hatches, rear loading ramps, or clamshell doors).
MIL-STD Class C Exit[1]	A window, door, hatch, or other exit closure intended primarily for emergency evacuation.
FAA Type A Exit[7]	Floor-level exit with a rectangular opening of not less than 42 inches wide by 72 inches high, with corner radii not greater than seven inches.
FAA Type B Exit[7]	Floor-level exit with a rectangular opening of not less than 32 inches wide by 72 inches high, with corner radii not greater than six inches.
FAA Type C Exit[7]	Floor-level exit with a rectangular opening of not less than 30 inches wide by 48 inches high, with corner radii not greater than 10 inches.

APPENDIX G. GLOSSARY.

Term	Definition
FAA Type I Exit[7]	Floor-level exit with rectangular opening of not less than 24 inches wide by 48 inches high, with corner radii not greater than eight inches.
FAA Type II Exit[7]	Rectangular opening of not less than 20 inches wide by 44 inches high, with corner radii not greater than seven inches. Must be floor-level unless located over the wing, in which case they must not have a step-up inside the airplane of more than 10 inches, nor a step-down outside the airplane of more than 17 inches.
FAA Type III Exit[7]	Rectangular opening of not less than 20 inches wide by 36 inches high with corner radii not greater than seven inches, and with a step-up inside the airplane of not more than 20 inches. If the exit is located over the wing, the step-down outside the airplane may not exceed 27 inches.
FAA Type IV Exit[7]	Rectangular opening of not less than 19 inches wide by 26 inches high, with corner radii not greater than 6.3 inches, located over the wing, with a step-up inside the airplane of not more than 29 inches and a step-down outside the airplane of not more than 36 inches.
Ventral Exit[7]	Exit from the passenger compartment through the pressure shell and the bottom fuselage skin. The dimensions and physical configuration of this type of exit must allow at least the same rate of egress as a Type I exit with the airplane in the normal ground attitude, with landing gear extended.
Tailcone Exit[7]	Aft exit from the passenger compartment through the pressure shell and through an openable cone of the fuselage aft of the pressure shell. The means of opening the tailcone must be simple and obvious and must employ a single operation.

APPENDIX H. ABBREVIATIONS.

CBRN	chemical, biological, radiological, and nuclear
cm	centimeter
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
ft	feet
JSSG	Joint Service Specification Guide
MIL-DTL	Military Detail
MIL-STD	Military Standard
MOPP	mission oriented protective posture
TOP	Test Operations Procedure

(This page is intentionally blank.)

APPENDIX I. REFERENCES.

1. Final Report, TR 89-D-22E, Aircraft Crash Survival Design Guide Volume V Aircraft Postcrash Survival, U.S. Army Aviation Systems Command, December 1989.

2. Report, Natick/TR-15/007, 2012 Anthropometric Survey of U.S. Army Personnel: Methods and Summary Statistics, U.S. Army Natick Soldier Research, Development and Engineering Center, December 2014.

3. MIL-STD-1290A, Military Standard Light Fixed and Rotary-Wing Aircraft Crash Resistance, Department of Defense, 26 September 1988.

4. Specification Guide, JSSG-2010-7, Department of Defense Joint Service Specification Guide Crew Systems Crash Protection Handbook, 30 October 1998.

5. MIL-STD-1472D, Department of Defense Design Criteria Standard Human Engineering, 14 March 1989.

6. Code of Federal Regulation, 14 CFR 25.807, Emergency Exits, Office of the Federal Register, National Archives and Records Administration, Version 1.19.1, 17 February 2021.

7. MIL-STD-1472G, Department of Defense Design Criteria Standard Human Engineering, 11 January 2012.

8. MIL-DTL-27422F, Department of Defense Detailed Specification for the Tank, Fuel, Crash-Resistant, Ballistic-Tolerant, Aircraft, 6 February 2014.

For information only (related publication).

MIL-STD-1807, Department of Defense Military Standard Crash Survivability of Aircraft Personnel, 1 June 1990.

(This page is intentionally blank.)

APPENDIX J. APPROVAL AUTHORITY.

CSTE-CI 3 August 2021

MEMORANDUM FOR

Commander, U.S. Army Operational Test Command
Director, U.S. Army Evaluation Center
Commanders, ATEC Test Centers
Technical Directors, ATEC Test Centers

SUBJECT: Test Operations Procedure 07-3-529A, Ingress, Emergency Egress, and Emergency Evacuation Testing of Army Aircraft

1. Test Operations Procedure (TOP) 07-3-529A, Ingress, Emergency Egress, and Emergency Evacuation Testing of Army Aircraft, has been reviewed by the U.S. Army Test and Evaluation Command (ATEC) Test Centers, the U.S. Army Operational Test Command, and the U.S. Army Evaluation Center. All comments received during the formal coordination period have been adjudicated by the preparing agency.

2. Scope of the document. This TOP specifies procedures for testing ingress, emergency egress, and emergency evacuation from U.S. Army aircraft. Components installed on the interior and exterior of the aircraft, as well as personnel equipment, may adversely affect ingress and emergency egress/evacuation from an aircraft. The inherent design of a particular aircraft may also contribute to the time required to egress safely depending on the number of crew doors and exits designated as emergency routes.

3. This document is approved for publication and has been posted to the Reference Library of the ATEC Vision Digital Library System (VDLS). The VDLS website can be accessed at https://vdls.atc.army.mil/.

4. Comments, suggestions, or questions on this document should be addressed to U.S. Army Test and Evaluation Command (CSTE-CI), 6617 Aberdeen Boulevard-Third Floor, Aberdeen Proving Ground, MD 21005-5001; or e-mailed to usarmy.apg.atec.mbx.atec-standards@mail.mil.

for MICHAEL J. ZWIEBEL
Director, Directorate for Capabilities Integration (DCI)

(This page is intentionally blank.)

Forward comments, recommended changes, or any pertinent data which may be of use in improving this publication to the following address: Policy and Standardization Division (CSTE-CI-P), U.S. Army Test and Evaluation Command, 6617 Aberdeen Boulevard, Aberdeen Proving Ground, Maryland 21005-5001. Technical information may be obtained from the preparing activity: U.S. Army Aviation Flight Test Directorate (TEDT-RT-ATC), 4880 Hale Rd, Redstone Arsenal, AL 35898. Additional copies can be requested through the following website: https://www.atec.army.mil/publications/documents.html, or through the Defense Technical Information Center, 8725 John J. Kingman Rd., STE 0944, Fort Belvoir, VA 22060-6218. This document is identified by the accession number (AD No.) printed on the first page.