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Materiel Test Procedure 8-3-080
U.S. Army Aviation Test Board

U.S. ARMY TEST AND EVALUATION COMMAND
COMMODITY SERVICE TEST PROCEDURE

AIRBORNE DISSEMINATION DEVICES

1. OBJECTIVE

This document provides existing test methods and techniques necessary to determine the degree to which dissemination devices and associated materials meet the mission requirements stated in the Qualitative Materiel Requirement (QMR), Small Development Requirement (SDR), Technical Characteristics (TC's), or other governing documents and whether or not these items are suitable for Army use.

2. BACKGROUND

2.1 Dissemination devices are used in military or paramilitary operations, counterinsurgency operations or any operation where lethalities may or may not be desired. The dissemination devices are designed to deliver a selected agent to the target in a form of liquid droplets, solid particles, a gas, a vapor, or an aerosol. Any leakage of chemicals or agents may thus pose a danger to operating personnel and contaminate the surroundings.

2.2 The dissemination of an agent by a dissemination device is dependent on many factors, e.g., the type, amount, and nature of the agent fill, the altitude and speed of the aerial delivery means, the design of the device, and meteorological conditions. In evaluating a test item, it must be remembered that once the agent fill is disseminated, the subsequent dispersion of the agent is wholly dependent upon the prevailing atmospheric conditions (temperature, wind, airspeed, stability, solar radiation, precipitation, or humidity), and those surface effects produced by terrain features and vegetation in the target area.

2.3 The dissemination device service tests will determine the capability of the device to safely disseminate a chemical agent from Army aircraft and provide required agent dissemination efficiency, cloud characteristics, and duration when deployed on simulated mission conditions over various terrain in varying weather conditions.

3. REQUIRED EQUIPMENT

3.1 MATERIALS AND TOOLS

a. Measuring tools for the determination of dimensions, weights, time and volume.
b. Test aircraft.
c. Test support aircraft.
d. Ancillary equipment as required for dissemination devices.

e. Photographic equipment.

1) Still camera, color and black and white film.
2) Motion picture camera and color film.
3) Microfilm cameras and film.

f. Protective clothing and equipment.
g. Decontamination materials and equipment as required.
h. First aid and medical supplies.
i. Applicable chemical agent(s).

3.2 INSTRUMENTATION

a. Meteorological equipment to measure and record--

1) Temperature.
2) Pressure.
3) Windspeed and direction.

b. Instrumentation calibration equipment.

3.3. FACILITIES

a. Suitable test range.
b. Suitable operational airfield(s) and equipment.

4. REFERENCES

A. Army Regulation No. 385-16, Safety: Safety for Systems, Associated Subsystems, and Equipment.
B. Army Regulation No. 70-38, Research and Development: Research, Development, Test, and Evaluation of Materiel for Extreme Climatic Conditions.
C. USAMC Regulation No. 385-12, Verification of Safety of Army Materiel.
D. USATECOM Regulation No. 385-6, Safety: Verification of Safety of Materiel During Testing.
E. USATECOM Regulation No. 70-23, Research and Development: Equipment Performance Reports (EPR's).
F. USATECOM Regulation No. 700-1, Quality Assurance: Value Engineering.
G. USATECOM Regulation No. 750-15, Maintenance of Supplies and Equipment: Maintenance Portion of the Service Test.
H. Military Standard 129D, Marking for Shipment and Storage.
I. Military Standard 130C, Identification Marking of U.S. Military Property.
J. Military Standard 704A, Electric Power, Aircraft Characteristics and Utilization of.
K. Military Standard 709A, Ammunition Color Coding.
L. Military Standard 882, System Safety Program for Systems and Associated Subsystem and Equipment, Requirements for.

M. MTP 8-2-513, Dissemination Characteristics, CB Munition/ Dissemination Devices.
N. TM 55-405-9, Weight and Balance.
O. FM 1-105, Army Aviation Techniques and Procedures.

5. SCOPE

5.1 SUMMARY

Determining the suitability of the dissemination device and equipment is only one element of the complete service test for those items. Additional elements are comprised of maintenance considerations, safety aspects, limitations in application, and human factors evaluations. To quantitatively evaluate these elements, service testing is conducted under field conditions by personnel representative of those who will be involved in actual combat operations. The observations of test supervisory personnel together with measurements taken of major subsystem or device parameters are recorded. Test personnel are interviewed, their observations and recommendations recorded and correlated with all still and motion pictures taken. The collected data are then reviewed to obtain those numerical indicators that characterize the device's performance. Tabulations, charts or other suitable devices are employed to display these indicators and facilitate device evaluation by comparison with the numerical values of desired performance criteria and with the performance indicators obtained from standard items.

5.1.1 Preparation for Test

This section provides guidance for test project planning, facility and equipment requirements, and instructions for test personnel familiarization.

5.1.2 Test Conduct

The tests and evaluations are arranged in a logical sequence to provide a step-by-step analysis of the suitability of the test items in performance of their prime function. These tests are as follows:

a. Inspection--This section provides procedures for determining the physical characteristics and condition of the test item(s) as received.

b. Installation Characteristics -- An evaluation of the subsystem installation suitability and performance characteristics after installation necessary for safe and effective operational conduct.

c. Flight Characteristics Testing -- An evaluation of the aircraft flight characteristics after device installation for the determination of safety and flight operational suitability.

d. Operational Effectiveness -- An operational evaluation to determine the suitability and safety of the dissemination device in performance of its prime function.

e. Maintenance -- Throughout the conduct of all test procedures, maintenance actions resulting from testing are noted and reported. Manpower, required tools and equipment, availability of repair parts, suitability of maintenance instructions, and mean time to repair are evaluated and recorded. Recommendations are solicited to reduce incidences of recurrent unscheduled maintenance and to simplify maintenance actions, as appropriate.

f. Subsystem Safety Evaluation -- An evaluation of design characteristics and operating procedures of the device which are potentially hazardous. The objective of the evaluation is to identify all hazardous characteristics of the device so that corrective action may be taken to minimize personnel injury, material failures, malfunctions and equipment losses.

g. Human Factors Evaluation -- An evaluation to determine adequacy of design, compatibility and operability as related to human factors.

5.1.3 Test Data

This section details the data to be collected and recorded while completing the test procedures in paragraph 6.2, Test Conduct.

5.1.4 Data Reduction and Presentation

This section provides instructions for evaluating and displaying the data recorded during testing.

5.2. LIMITATIONS

This MTP is intended to be used as a basic guide for the U.S. Army Aviation Test Board test plans for agent dissemination devices. Specific criteria and test procedures are to be determined by the requirements established in the appropriate QMR, SDR, or TC

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Test Project Planning

The project officer and other test personnel designated must --

a. Review the test directive received from higher headquarters to gain a clear understanding of test objectives and all accompanying instructions.

b. Conduct a thorough study of requirement statements as contained in QMR's, SDR's, or other stated requirements to insure that complete and suitable test criteria are selected.

c. Study the device's operational and technical characteristics.

d. Plan for and schedule all test personnel and any personnel training required.

e. Determine all equipment support items required. All such items not available at the test location must be arranged for and any associated required shipment scheduled.

f. Review the listing of required equipment (paragraph 3). Based on this review, the required items together with any operating personnel needed will be selected and scheduled.

6.1.2 Required Equipment/Personnel/Facilities

a. Aircraft device and flight test projects conducted at the established USAAVNTBD facility will require little preparation with respect to equipment and facilities setup. Major items required are usually readily available but scheduling and planning for use are required.

b. Dissemination device test projects are sometimes required to be conducted at locations other than USAAVNTBD. When this occurs, required equipment and facilities not available at the locations designated for test conduct must be provided through coordination with appropriate agencies or shipment from the Board as applicable.

c. Aircraft, aircrewmen, and associated equipment used during the service test will be those which are representative of a unit in the field.

d. Project personnel will perform ground handling, aircraft loading, preflight maintenance, and checkout of concerned systems utilizing common tools, ground support equipment, and other equipment or special tools required for the test.

e. The mission profiles will be planned using actual missions as a basis and provisions will be made for scheduled and unscheduled maintenance.

f. Trained ground and air observers using ground-to-air and air-to-air radio communications equipment will be used to the extent the selected mission requires.

g. An adequate test site will be selected based upon considerations of the following site characteristics:

1) Sufficient isolation to prevent inadvertent exposure to chemical agent(s).
2) Adequate dimenaions to allow proper evaluation of the dispersion characteristics of the disseminating device.
3) Desired type of terrain and vegetation.

h. A grid design will be provided which allows optimum sampling designed for the test site.

i. All agent test and measuring instrumentation utilized for data acquisition will be calibrated and certified prior to use and at the completion of testing.

j. Applicable collecting devices (samplers) will be installed as appropriate in the form of an enclosing vertical and horizontal array. A sufficient number of sampling devices will be placed on the test site to accommodate wind shifts.

k. Meteorological instruments capable of measuring variations of temperature, temperature gradient, windspeed and direction, pressure, precipitation, and any other applicable meterorological conditions that may exist within the expected area of dissemination will be located on the test site.

l. Motion picture cameras and, as applicable, other devices such as surveyor transits, phototheodolites, etc., to observe both the initial functioning of the dissemination device and the dissemination cloud's formation, movement, and dispersion will be appropriately located.

m. An appropriate aircraft, independent of the agent dissemination aircraft, will fly along with the dissemination aircraft. The aircraft will be equipped with cameras and timing equipment to observe the initial dissemination from the test aircraft and the dissemination cloud's formation, movement, dispersion and time of dispersion. Upon signal by radio, the aircraft will photograph the disseminating aircraft and continue to observe the dissemination cloud formation until dissipation. The observer aircraft will time the agent dissemination from initial release until cloud dissipation. The observer aircraft crew should have protective masks available in case of inadvertent exposure to agents.

n. The aircrew will be provided with disposal area locations in case of an inflight emergency.

6.1.3 Test Personnel Training and Familiarization

All members of the test team shall be familiar with service test objectives and specific QMR or SDR requirements. Selection of military personnel shall be done randomly within the required MOS to obtain personnel of various skill levels and background for testing and for

determining the level of proficiency required to maintain the device. Proceed as follows:

a. Review all safety precautions and possible hazards associated with the device under test and potential hazards of the overall testing environment. The review shall include, but need not be limited to, the following:

1) Fire hazards, fire prevention, and firefighting.
2) Electrical shock hazards, prevention, and emergency action required.
3) Hazard involved when servicing and operating dissemination devices and/or munitions.
4) Emergency procedures.
5) Paragraph 4-16a, AR 95-1, requirements for protective mask.
6) Insure all crash rescue personnel are fully briefed and equipped to counteract the agents being tested.

b. Provide instructions in the capabilities, operation, and limitations of the device. Ground and aircrew personnel training should include operational instruction in the following, as applicable:

1) Nomenclature and characteristics of the device under test and the aircraft from which they may be used.
2) Methods of servicing the disseminating device.
3) Effects of weather, terrain, and altitude on the effectiveness of the agent dissemination.
4) Pattern to be flown on the dissemination mission.
5) Recommended dissemination delivery techniques and the necessary information for the method of optimum dissemination altitude(s), attitude(s), and distance upwind from the longitudinal marking line, if available.
6) Review of control and coordination procedures which apply to low level dissemination methods. Sufficient time for practice of dissemination missions should be made available with protective clothing and equipment used.

c. Instruct aircrew on when to use the protective clothing and equipment; check aircrewmen during flight training to insure all required crew functions can be performed when protective clothing and equipment are being used. All members will be thoroughly indoctrinated with the characteristics of the agent, equipment to be used, familiarization with proper handling procedures, and safety precautions. Assure that provisions have been made for in-flight detection of malfunctions, first aid for crewmembers, and decontamination of personnel and equipment if it becomes necessary.

d. Inform test personnel of service subtests objectives and detailed procedures of individual tests.

e. Provide prevailing meterorological conditions in the target area.

6.2 TEST CONDUCT

6.2.1 Inspection

NOTE: Precautions should be taken and protective equipment should be used by personnel during the physical uncrating of agents.

6.2.1.1 Initial Inspection

Upon receipt of the subsystem at the test site perform the following:

a. Examine the packaged device and/or munitions and equipment for evidence of the following:

1) Physical condition after transportation or storage.
2) Exterior identification markings in accordance with Military Standard 129 or other governing documents.

b. Unpack and remove all traces of protective transport/storage materials. When this has been accomplished, inspect the subsystem for the following:

1) Interior markings of shipment in accordance with Military Standard 130 or other governing documents.
2) Physical condition.
3) Compliance with color coding requirements of Military Standard 709.

6.2.1.2 Inventory Check

Conduct an inventory against the Basic Issue Items List (BIIL). Submit Equipment Performance Reports(EPR's)for each noted shortage, overage, or other discrepancy.

6.2.1.3 Physical Characteristics

a. Determine the physical characteristics of the dissemination device and associated equipment under test by photographing, weighing, and measuring of each major unit and the complete subsystem.

NOTE: Dissemination device characteristics obtained during the engineering test should not be redetermined here unless data required are not

available from engineering test results.

b. Calculate, prior to the installation of the device, the aircraft's weight and center of gravity (c.g.) with the subsystem loaded and empty to determine --

1) Effect of full loaded and empty device on aircraft weight and c.g.
2) Need for ballast requirement for each designated aircraft type and the weight and location of ballast to retain the c.g. within limits.

c. Resolve, prior to installation or testing, aircraft/test item weight and balance condition that appears to exceed the limits as specified in the appropriate aircraft manual.

6.2.1.4 Preoperational Inspection

a. Inspect for serviceability in accordance with the draft technical manual.

b. Examine agent tanks or munitions for deterioration or flaws which could be hazardous to the aircraft or effect agent dissemination performance.

c. Inspect visually the dissemination device for the following:

1) Visible evidence of agent leakage under pressure.
2) Evidence of damage, i.e., cracks, dents, broken components, etc.
3) Evidence of deterioration.
4) Any other condition which may contribute to agent leakage.

d. Calibrate and certify repair and maintenance test and measuring equipment prior to use and at the completion of testing.

6.2.2 Installation Characteristics

Install the dissemination device in accordance with the appropriate manuals and manuscripts provided to verify their adequacy. Perform the following checks:

a. Determine after the equipment has been installed, and through aircraft power-on, preflight testing, that the installation will not alter safety characteristics or present an in-flight hazard to aircrewmen.

b. Test electrical continuity on the installed device with the aircraft power source off.

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b. Test electrical continuity on the installed device with the aircraft power source off.

c. Examine device requirements for aircraft electrical power and ensure that expected loads under any mode will not exceed aircraft electrical capacity. Military Standard 704 may be consulted for additional guidance in this area of compatibility.

d. Test electrical power and stray voltage with all electrical and avionics equipment turned on while the aircraft engine(s) or motor is at operational revolutions per minute (RPM) and all intermediate points such as ground idle and flight idle.

e. Measure the clearances from the aircraft, surface, and dissemination device as appropriate.

f. Determine the aircraft(s) weight and balance for critical conditions in accordance with TM 55-405-9.

g. Verify the dissemination device jettison capability, if applicable.

6.2.3 Flight Characteristics Testing

Following installation and successful preflight checkout of the test item aircraft storage or dissemination device, determine under daylight and otherwise VFR flight conditions that the device and associated

equipments have not introduced undesirable flight characteristics as follows:

a. Service the designated aircraft storage, tanks, device, etc., with agent(s) or with a simulated composition such as talc. Prepare the aircraft for flight as prescribed by the flight manual and prevailing local regulations.

b. Takeoff and maneuver the aircraft throughout its established flight envelope. Conduct maneuvers typical of those required when utilizing the dissemination device and determine the following:

1) Effects on aircraft stability and control.
2) Effects on aircraft c.g. locations.
3) Maximum positive and negative "g's" pulled during the flight, if appropriate.
4) Pilot's judgment of the aircraft's flight characteristics with the dissemination device and required equipment aboard.
5) Aircrew's and other qualified observers' observations regarding aircraft flight characteristics.

c. Perform landings on various types of runway surfaces (improved and unimproved) varying the approach angle and rate of descent allowable for the aircraft. Determine the following:

1) Optimum approach or glide angle.
2) Optimum rate of descent.
3) Maximum acceleration (g's) effects from landing, as appropriate.
4) Ground roll distance, as applicable.
5) Visually inspect the test subsystem for damage.

d. Determine that the dissemination device, equipment, and recommended delivery technique(s) are safe for operational use in each designated test aircraft type. Under normal flight conditions disseminate the agent(s) for each designated test aircraft under the following controlled flight conditions.

1) Varied airspeed from slow cruise to V max. and hover, as appropriate.
2) Various altitudes and airspeeds or as specified by the QMR, SDR, or TC's in equal gradients of altitude.
3) Various flight attitudes, as appropriate; i.e., climb, descent, climb and bank, descent and bank, maintain set course and altitude, and autorotation.

e. Observe and photograph the dissemination release and agent dispersion patterns with relationship to the aircraft from a chase aircraft.

f. Observe and photograph the dissemination cloud and determine the wind effects on the cloud for necessary corrections to hit the target. The following chart (Figure 1) may be used as a guide when disseminating an agent in a solid powdered form.

g. Evaluate the controlled flight characteristics of section 1) through 3) above and select the flight profile which will provide the most accurate and safe method of agent dissemination such as --

1) Airspeed.
2) Altitude.
3) Attitude.
4) Upwind distance from the target.
5) Special maneuver(s) or technique(s) which may have been developed by the test pilot.

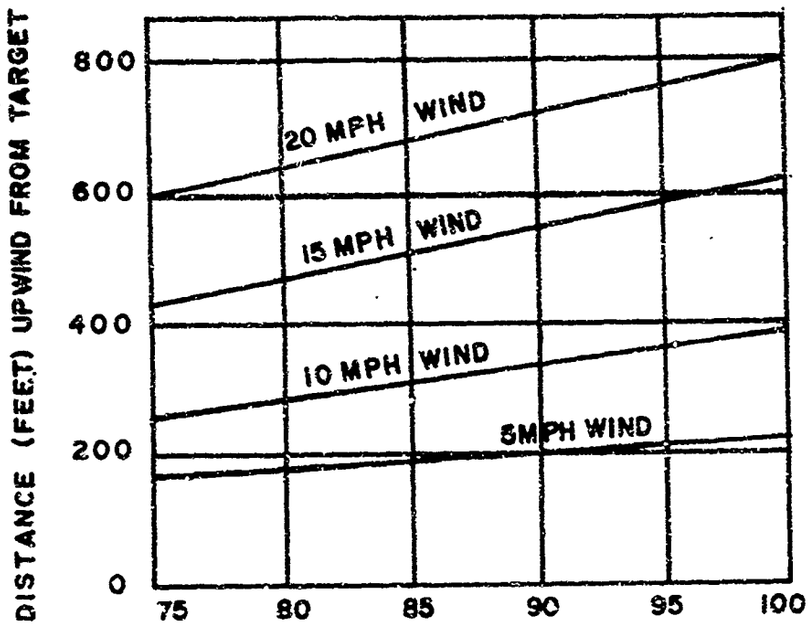

Figure 1. Wind correction chart

h. Compare any known restrictions regarding discharge, delivery, or ejection of material from each designated aircraft with the recommended delivery technique for the subsystem. Investigate any delivery technique which appears to endanger or effect aircraft flight characteristics. Where a problem area is determined to exist, halt testing until detailed safety-of-flight studies can be accomplished.

6.2.4 Operational Effectiveness

Perform those missions necessary to determine the dissemination device suitability for the QMR or SDR requirements under varying weather conditions and other varying terrains.

a. During the conduct of the selected dissemination mission, evaluate and rate the adequacy of the device in terms of compatibility with the aircraft and flight personnel. Proceed as follows:

1) Prepare the device for flight mission by servicing it with agent(s) and/or munitions. Perform a preflight. Time these operations. The agent will be accurately weighed in order to determine agent dissemination rate, as appropriate.
2) Takeoff, maneuver, hover, if applicable, and operate the aircraft at speeds normal to mission flight profiles, and within established limitations. Instruct personnel to determine, prior to dissemination of the agent, operating conditions at which aircraft performance is changed or degraded. Photograph as appropriate.

b. During the conduct of the selected mission, evaluate the effectiveness of agent dissemination density, rate of dissemination, duration and effects of weather and terrain on the disseminated agent as observed by both ground and aerial observers. Proceed as follows:

1) Obtain meteorological data prior to all flight operations. The project officer will assign observer stations for the dissemination site coverage. (See 6.1.2).
2) Utilizing the optimum agent dissemination delivery, airspeed and altitude established in paragraph 6.2.3, disseminate the agent(s) over the designated area. Observers will perform test coverage utilizing cameras, stopwatches, and personal observation from the air and ground, as appropriate.
3) Measure the following meteorological conditions at the test site during dissemination test, as applicable:

a) Ground level temperature.
b) Vertical temperature gradient.
c) Windspeed and direction.

d) Relative humidity.
e) Precipitation

4) Measure the following flight conditions during dissimination, as applicable.

a) Altitude.
b) Airspeed.
c) Attitude.
d) Upwind distance from the target.

5) Evaluate the agent dissemination flow rate as follows:

a) Observe the total time of dissemination after functioning release.
b) Observe the nature of dispersion - vertical, horizontal, radial, etc.
c) Weight of agent tank or device after dissemination to determine the weight of agent disseminated during test, if applicable.

6) Evaluate the following agent cloud characteristics, as applicable:

a) Approximate width, length, and height of the cloud as a function at time.
b) Length of time the effective cloud persisted in the area.
c) Length of time required for complete cloud dissipation.

7) Disseminate and evaluate the agent dissemination over varying areas and terrain such as rivers, swamps, marsh lands, wooded areas, sandy beaches, heavy brush, as applicable.

NOTE: The agent to be disseminated must be evaluated to determine if its characteristics are such that contamination of the test area and/or surrounding area will result.

c. Evaluate the effects of wind, rotor/propeller wash on the agent dissemination cloud.

d. Inspect the aircraft after each dissemination flight for possible damage or contamination.

e. Evaluate the overall capability and effectiveness of the dissemination device to perform as intended when called upon during critical mission phases.

f. After each flight test personnel involved should evaluate how well the device and its associated equipment and controls are integrated into the overall preparation for flight and mission activities. As a minimum, the following items should be considered:

1) Flight personnel compartment arrangement for operating dissemination device controls, as applicable.
2) Disperser or agent tank accessibility and maintainability.
3) Aircraft trim changes during delivery of chemical agent.
4) Chemical agent(s) effects on aircraft not previously determined.

g. Record malfunction and failure data throughout all service tests and determine, as one of the principal indicators of dependability, the mean number of disseminations from the device before subsystem performance departed from the specified level required by the QMR or SDR.

6.2.5 Maintenance Evaluation

Evaluate the subsystem maintainability and reliability characteristics as required by the QMR or SDR. In particular, throughout the conduct of service tests, personnel of appropriate MOS levels and varying proficiencies shall perform all maintenance functions listed in the draft technical manual and determine the following:

6.2.5.1 Maintainability

a. List and provide details of occurrences for scheduled maintenance without downtime and unscheduled maintenance with minimum downtime (minor adjustments).

b. Indicate the skill levels necessary to install, maintain, and remove the device from each test aircraft.

c. List and provide details of occurrences for unscheduled maintenance involving excessive downtime and/or replacement or repair of components and the total device.

d. Compute the turnaround time by servicing the device after each mission. Use various numbers and skill levels of personnel to determine the minimum, optimum and average turnaround time.

6.2.5.2 Reliability

Throughout the service test, personnel of appropriate MOS levels shall evaluate the reliability of dissemination devices by determining the following:

a. Device and/or munition failure modes.
b. Component or features of associated equipment involved in malfunctions and methods used to determine the cause.
c. Agent dissemination failure.

d. Total accumulated run time of the failing component of associated equipment.

e. Damage or contamination to delivery aircraft due to device, agent or associated equipment failure or malfunction.

f. Optimum repair procedures.

g. Number of dissemination runs.

6.2.5.3 Tools and Test Equipment Required

a. Indicate the adequacy of the common and special tools to perform the specified maintenance and repair functions.

b. Indicate the suitability of the test equipment for the performance of established testing functions, necessary test equipment maintenance and calibration, if required.

c. Evaluate the effects of subsystem design on the availability of tools and test equipment, operability of tools and test equipment, human factors, and value analysis of tool and test equipment utilization and selection.

6.2.5.4 Adequacy of Technical Manuscripts and Manuals

a. Evaluate the adequacy and simplicity of the technical manuscripts and manuals for the intended maintenance level.

b. Verify the technical documentation against the device for completeness, accuracy, and clarity.

c. Report any difficulties experienced, errors, and/or omissions and provide suggested changes or improvements to the maintenance package when applicable.

6.2.6 Safety

Safety confirmation shall comply with the requirements of USATECOM Regulation No. 385-6. Category II, III, or IV hazards, as defined by paragraph 3.14, Military Standard 882, will be reported to the project officer where a decision will be made as to the continuation of testing. Throughout the service test, observe characteristics and identify those which presented a potentially hazardous condition or were directly or indirectly the cause of any hazard and perform the following:

a. Examine device, agent tanks and/or munitions, and associated equipment for the presence of necessary guards, shields, interlocks, warning plates, and safety fuze markings.

b. Verify the proper operation of all safety devices provided.

c. Observe, throughout all tests, hazards to personnel and aircraft safety-to-flight characteristics. Determine the following:

1) Nonoperable safety features.
2) Inadequate warning statements.
3) Safety-of-flight characteristics altered.
4) Recommendations for additions to subsystem safety procedures and/or features.

d. Review safety release restrictions with test personnel. The test officer is responsible for assuring that all test personnel are throughly briefed on all safety procedures and limitations connected with the test item prior to conducting the test.

6.2.7 Human Factors Evaluation

6.2.7.1 Evaluate the effectiveness of the man-subsystem interaction as related to all phases of dissemination device operation with special attention given to design induced personnel error and design deficient areas. Prepare checklists for all tasks associated with all phases of operational use, including transportability and ground handling/loading. These checklists shall be used to rate each task as satisfactory or unsatisfactory. Consider the following for all tasks:

a. Communications quality of instructions as indicated by ease of understanding of draft technical manuals.

b. Relative indications of physical effort required to prepare, fill, and load the device aboard designated aircraft with protective clothing and equipment worn as required.

c. Device design effects on the compatibility with aircrewmen and aircraft such as compartment arrangements, controls, etc.

d. Minimum and optimum number of personnel and the skill level(s) required.

e. Time(s) required.

6.2.7.2 Evaluate the subsystem to aircraft and personnel suitability and compatibility when using protective clothing and equipment during the phases of operation.

6.2.7.3 Perform the following tasks for the test functions indicated. The factors considered shall include, but not be limited to the following:

a. Operability.

1) Fill, assemble and load.
2) Prepare for use.
3) Deliver.
4) Unload aircraft and store.

b. Maintainability.

1) Perform routine maintenance.
2) Detect malfunction; isolate and identify cause.
3) Remove defective component and replace or repair.

c. Transportability.

1) Prepare for transport.
2) Load/unload.
3) Secure/unfasten.

6.3 TEST DATA

In compiling the test data section, test personnel should expound upon those data procedures which are other than quantitative in nature by recording narrative descriptions which provide full details of conditions and/or events occurring during test conduct.

6.3.1 Inspection

6.3.1.1 Initial Inspection

Record the following:

a. Any deviations of characteristics from the stated requirements.

b. Exterior identification markings not in accordance with Military Standard 129 or other governing documents.

c. Interior markings of shipment not in accordance with Military Standard 130 or other governing documents.

d. Munition chemical color coding not in accordance with Military Standard 709.

e. Physical condition and certification.

6.3.1.2 Inventory Check

Record the completeness of the shipment when individually received items are compared against the BIIL. Also, indicate the existence

of materiel discrepancies in the shipment and the number of EPR's which were prepared.

6.3.1.3 Physical Characteristics

Record the following:

a. Length, width, and height of each major component(s).

b. Mathematical calculations of aircraft's weight and c.g. location data for --

1) Aircraft c.g. loaded and empty subsystem.
2) Aircraft gross weight with subsystem loaded and empty.
3) Weight and location of any ballast required.

c. Unsafe or hazardous conditions produced by unsatisfactory subsystem weight and balance conditions including flight/load conditions that may cause the predicted condition.

6.3.1.4 Preoperational Inspection

Record the following:

a. Serviceability of the dissemination device and ancillary equipment.

b. Condition of the agent tank or agent container mechanism, and/or munition(s).

c. Condition of the device or tank mounting/tie-down provisions.

d. Evidence of device leakage, damage, deterioration, or improper installation.

e. Certification of repair and maintenance test and measuring equipment calibration.

6.3.2 Installation Characteristics

Record the following:

a. Results of electrical continuity test by measuring electrical resistance, in ohms.

b. Predicted power requirements constraints imposed by addition of dissemination device or associated equipment(s).

c. Power requirements for the device and stray voltage indications using a volt meter.

d. Clearance distance measurements from the aircraft and the surface and dissemination device.

e. Weight and moment data for each test aircraft and for each specific mission configuration in accordance with TM 55-405-9 and as follows:

1) Total system moment, M_s.
2) Actual center of gravity (c.g.).
3) Location of new c.g. in inches (or fuselage station) from the datum.
4) Weight and location of ballast, if applicable.
5) Predicted vertical performance as a function of gross weight (per each mission configuration) for selected values of pressure altitudes, and outside air temperatures.

6.3.3 Flight Characteristics Testing

6.3.3.1 Record the following:

a. Effects on aircraft stability and control.

b. Effects on aircraft c.g.

c. Acceleration loads in g's pulled during the flight.

d. Pilot's judgment of the aircraft flight characteristics with the dissemination device and required equipment aboard.

e. Qualitative analysis by aircrew of the aircraft's flight characteristics with the device and required equipment aboard.

f. Optimum approach angle.

g. Optimum rate of descent.

h. Maximum acceleration (g's) effects from landing.

i. Ground roll distance, as appropriate.

j. Condition of dissemination device.

k. Altitude and airspeed at the time of agent dissemination.

l. Attitude at the time of agent dissemination.

m. Any delivery techniques that appear to present a hazard.

n. Any special flight profile techniques that provide the most effective dissemination over the test area.

o. Upwind distance from the target at the time of release, expressed in feet.

p. Optimum flight characteristics that provide the most accurate and safe dissemination method such as:

1) Airspeed.
2) Altitude.
3) Attitude.
4) Upwind distance from the target.

q. Contamination effects, if any, during autorotation.

r. Any indications of hazardous delivery techniques or flight profiles that caused contamination, erratic flight characteristics or other changes noted or determined from the test coverage.

6.3.3.2 Identify all photographs and motion film taken.

6.3.4 Operational Effectiveness

6.3.4.1 Record the following:

a. Compatibility with the aircraft and aircrewmen:

1) Evidence that the dissemination device or munition storage arrangements demanded too much space and interfered with or prevented adequate or proper operation of the aircraft or subsystem.
2) Evidence of excessive aircraft trim changes as dissemination subsystem load was delivered.
3) Adequacy of the crew compartment arrangement for operation of controls where applicable.
4) Chemical agent(s) effects on aircraft.
5) Device or agent tank accessibility.

b. Meteorological conditions as the test site:

1) Ground level temperature, ^{o}F.
2) Vertical temperature gradient, ^{o}F.
3) Windspeed and direction.
4) Atmospheric pressure, inches of mercury.
5) Precipitation, in inches of water.

c. Flight conditions during dissemination:

1) Altitude.

2) Airspeed.
3) Attitude.
4) Downwind distance from the target.

d. Agent cloud characteristics:

1) Approximate width, length, and height of cloud as a function of time from delivery.
2) Time of effective cloud persistency.
3) Elapsed time of cloud dissipation.

e. Effects of terrain on agent cloud dissemination:

1) Presence of trees, vegetation, etc.
2) Nature of ground cover or reflectivity, etc.
3) Configuration of the surface or presence of man-made features as applicable.

f. Effects of wind, rotor/propeller wash on the agent cloud dissemination.

g. Capability or effectiveness of the dissemination device performance during critical mission phases.

h. Malfunction and failure data throughout the test phase, mean number of disseminations from the device before performance departure.

6.3.4.2 Identify all photographs and motion film taken.

6.3.5 Maintenance Evaluation

6.3.5.1 Record the following:

a. Data required by the applicable QMR or SDR.

b. Maintainability:

1) Scheduled downtime details.
2) Required skill levels for adequate maintenance.
3) Unscheduled downtime maintenance details.
4) Minimum and optimum dissemination device turn-around time.

c. Reliability:

1) Indication of failure.
2) Component or features of associated equipment involved and method used to determine the cause of malfunctions.
3) Elapsed time since previous device or related equipment failure.

4) Total accumulated runtime on the failing component of associated equipment.
5) Any damage to delivery aircraft due to the device or munition or associated equipment failure or malfunction.
6) Repair procedures followed, downtime, and personnel, material and tools required.
7) Number of device or munition failures.
8) Number of drops.
9) Mean rounds to stoppage, when applicable.

d. Tools and Test Equipment Required:

1) Adequacy of tools and test equipment to perform assigned tasks.
2) Adequacy of test equipment without unscheduled maintenance or calibration.
3) Evaluation of device effects on tools and test equipment availability, human factors, and value analysis.

e. Adequacy of Technical Manuscripts and Manuals:

1) Adequacy and simplicity of technical manuscripts and manuals.
2) Accuracy, completeness, and clarity of the technical documentation.

6.3.5.2 Provide suggestions or changes to the maintenance package as a result of service tests.

6.3.6 Safety

6.3.6.1 Record the following:

a. Effectiveness of safety features.

b. Adequacy of warning plates.

c. Adequacy of safety features such as interlocks, guards, covers, and protective shields as applicable.

d. Recommendations for improvements in device safety features, operating procedures, working or presentation of warning plates, etc.

e. Device safety confirmation recommendation.

6.3.6.2 Provide photographs in report, as appropriate.

6.3.7 Human Factors Evaluation

6.3.7.1 Record the following:

a. Individual human factors checklists for each element of the service test which indicate the adequacy of the man-item interaction through operational use. Particular emphasis should be placed on the man-item interaction when personnel are wearing and using protective clothing and equipment.

b. Any limitations, discomforts, psychological, and/or physiological effects produced by the protective equipment used.

6.3.7.2 Provide photographs of shortcomings or deficiencies, if applicable.

6.4 DATA REDUCTION AND PRESENTATION

Summarize all data using tabulations and/or charts as appropriate. Analyze the data collected to determine if the dissemination device is suitable for use. Provide a narrative description of the suitability and degree of suitability of the device to perform its prime function. Include limitations in type of equipment and supplies that can be accommodated and, for airdrop items, limitations in altitude, airspeed, and ground-wind velocity within which the items can function properly. Identify any unusual device requirements for handling, maintenance, deployment, or modifications to aircraft, as appropriate. If a dissemination device is not suitable for its intended purpose, provide a complete description (including test results) of why the item is so adjudged.

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13. ABSTRACT
Procedures are prescribed for evaluating the functional suitability and compatibility of airborne dissemination devices.

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