INCH-POUND

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DEPARTMENT OF DEFENSE
TEST METHOD STANDARD

TESTING OF CHAFF
RADAR CROSS-SECTION

ASMC N/A FSC 5865

FOREWORD

1. This standard is approved for use by the Naval Air Systems Command, Department of the Navy and is available for use by all Departments and Agencies of the Department of Defense.

2. The purpose of this standard is to describe and illustrate practices and procedures to be followed when measuring the radar cross-section (RCS) of airborne dispensed chaff countermeasures for acceptance purposes. This standard relates the prescribed requirements to the existing stage of technological achievement, making the most effective use of commercially available, state-of-the-art equipment.

3. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

CONTENTS

CONTENTS

CONTENTS

CONTENTS

1. SCOPE

1.1 Scope. This standard establishes the procedures, requirements, and instructions for testing chaff payloads under flight conditions to determine compliance with the associated system performance or detail specification specified in the contract.

2. APPLICABLE DOCUMENTS

2.1 General. The document listed in this section is specified in sections 3, 4, and 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4, and 5 of this standard, whether or not they are listed.

2.2 Government documents.

2.2.1 Government publication. The following other Government publication forms a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DEPARTMENT OF DEFENSE

Flight Information Publication, VFR-Supplement, United States

(Copies of the above publication are available from the Naval Ordnance Station Distribution Branch N/ACC33, 6501 Lafayette Avenue, Riverdale, MD 20737.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 Acronyms used in this standard. The acronyms used in this standard are defined as follows:

a. μsec - microseconds (10^{-6})

b. BW - bandwidth

c. dB - decibels

d. GHz - gigahertz (10^9)

e. Hz - Hertz

f. IF - Intermediate Frequency

g. MHz - megahertz (10^6)

h. nsec - nanoseconds (10^{-9})

i. nmi - nautical mile

j. P/F/S - Pulse per Frequency, per Second

k. PRF - Pulse Repetition Frequency

l. PRI - Pulse Repetition Interval

m. PRP - Pulse Repetition Period

n. PRR - Pulse Repetition Rate

o. PW - Pulse Width

p. RCS - Radar Cross-Section

q. SOW - Statement of Work

r. SFR - Step Frequency Radar

s. TACAN - Tactical Air Navigation

t. VFR - Visual Flight Rules

u. VMR - Visual Meteorological Conditions

3.2 Antenna beamwidth. The angular width of the main beam in a plane (horizontal or vertical) measured between 3 dB points (one-way transmission).

3.3 Antenna polarization. The direction of maximum gain of the radiated wave when the antenna is excited. Alternatively, the polarization of an incident wave from the given orientation that results in maximum available power at the antenna terminals.

3.4 Aspect angle. The aspect angle is the angle formed by the intersection of two lines, one of which extends from the radar antenna to the point in the chaff cloud where measurements are being made and the other which extends through the axis of the chaff cloud along which it was deployed. The latter is usually a line along which the chaff deploying aircraft moves. The aspect angle is composed of two components, one in the elevation plane and the other in the horizontal or azimuth plane. The elevation angle is defined by altitude and range while the azimuth angle is defined by the true course of the aircraft and the offset distance from the radar to the true course line.

3.5 Associated specification. An associated specification is a general specification, detail or performance specification, specification sheet or purchase description that covers requirements for specific parts, materials, equipments, or systems. The associated specification is the requirements document cited in the solicitation SOW or contract.

3.6 Chaff rocket. Chaff packaged in a container that is propelled by a rocket motor is called a chaff rocket. Chaff rockets are air or surface launched, and may deploy discrete chaff units or continuous chaff.

3.7 Continuous chaff. Continuous chaff (also known as corridor chaff) is chaff deployed for long periods of time to protect targets over a large area (also referred to as bulk-or wide area-chaff) and requires a different technique than discrete self-protected chaff.

3.8 Discrete chaff unit. A package, cartridge, or other container filled with chaff material that is deployed at one time to form a chaff cloud is called a discrete chaff unit. Discrete chaff units may be deployed singularly, in multiple units simultaneously, or in rapid sequence. Discrete chaff units form individual chaff clouds that may be spaced apart or may be overlapping.

3.9 On-site data processor. A portable data analysis system which is capable of analyzing real time data and printing out resultant information at the test location.

3.10. Processing - average pulse-to-pulse radar cross-section. A means of determining the average geometric cross-section of a chaff cloud or area within the cloud by averaging a large number of amplitude returns (pulses) from the cloud.

3.11 Processing - ΔK. A factor used to calibrate the RCS processing equipment to the measuring radar. ΔK is a ratio of transmittal power to receiver sensitivity, and affects the numerical RCS values by 0.33 dB per ΔK integer.

3.12 Processing - first level statistics. First level processing of RCS data involves calculating average values, statistical data, and other information or presentations where the inputs to the processing are the raw pulse-to-pulse RCS values. First level processing is done for each discrete chaff unit or a sample (a given number of consecutive pulses) of continuous chaff or very large chaff clouds.

3.13 Processing - percentile value. In RCS statistics, the percentile value is that value which a given percent of data points equal or exceed. As an example, a percentile value of 70 percent of 10 square meters mean that 70 percent of the data points would have an RCS value of 10 square meters or more. A data point in the first level statistics is the RCS value obtained on a given radar pulse, while a data point in the second level statistics is the average RCS value of a chaff unit or chaff sample.

3.14 Processing - second level statistics. Results from the first level processing are used as inputs to calculate average RCS values for each radar frequency, statistical data, or other information or presentations in the form of second level statistics for a group of similar units.

3.15 Processing - shadow graphs. Shadow graphs visually display RCS values as a function of time and range to pictorially show scintillation, physical cloud growth, homogeneity of the cloud, and other details. A printer or plotter is used to show pulse-to-pulse RCS values where a solid black line is calibrated to maximum RCS and white to no RCS. The various shades from black to white then show relative RCS values. Lines may be printed for each radar pulse, or spaced “N” pulses apart, where “N” may be any integer. The shadow graph may be presented on a color monitor where color may be used to increase the dynamic range of the presentation.

3.16 Processing - spectral data. Spectral data are used to present the unique spectral signature of a chaff cloud as observed by the measuring radar and is a function of the Fast Fourier Transform algorithm applied to the pulse-to-pulse amplitude data. The data are presented graphically to display the power spectral density of the chaff cloud (volts^2) relative to the frequencies of interest (0-500 Hz).

3.17 Radar cross-section (RCS). RCS is defined as the return signal to a radar where

$$\text{RCS} = \sigma = 4\pi \frac{\text{Power reradiated by the target per steradian}}{\text{Power incident on the target per unit of area}}$$

Physically, the RCS of a body is equal to the geometric cross-section of a sphere (large compared to wavelength) which would give the same return if placed at the same point in the radar antenna beam.

3.18 RCS frequency spectrum. The radars intended to be targeted by the chaff countermeasure fall in the range of 2-18 GHz and 35 GHz. This is considered the chaff RCS frequency spectrum to be measured.

3.19 Radar pulse repetition frequency - Also pulse repetition period, pulse repetition interval, and pulse repetition rate. The number of transmitted pulses per unit of the time (seconds), or the time interval between the leading edges of consecutive pulses. This may be stated as pulses per frequency, per second (P/F/S).

3.20 Radar pulsewidth (pulse duration). The time interval between the leading and trailing edges of the transmitted pulse.

3.21 Radar range gate. As applicable to the processing equipment described herein, a number of adjacent range gates are measured in amplitude for each transmitted pulse, normally 15. When the range gate spacing within the processor is set equal to the pulse width of the radar, the range gates can be equated to the resolution-cell as it moves out in range from a reference starting point to a distance of 15 adjacent cell spacings from that starting point.

3.22 Radar resolution-cell (radar cell). A term used to describe the cell volume from which return signals are received. For a pulse radar, the cell volume is defined by the pulse length and the half-power beamwidth (horizontal and vertical angular resolution) of the radar antenna.

3.23 Real time processor. A system providing absolute RCS values while the test run is being made.

3.24 Shielding. Shielding is a condition whereby some of the elements in the chaff cloud are not illuminated by the full power of the radar because other elements nearer to the radar have scattered part or all of the energy out of the beam. The shielded elements are responsible for less measured RCS than an equivalent number of unshielded elements. The degree of shielding can vary from zero, where each element makes maximum contribution to the RCS values, to 100 percent, where some of the elements contribute nothing to the measured RCS values.

3.25 Spectral frequency. The distribution of Doppler frequencies caused by amplitude or cross-section fluctuations (scintillation) of the dipoles within a chaff cloud.

3.26 Tactical air navigation. Equipment installed in aircraft and capable of receiving signals from a ground station for bearing determination and transmitting coded pulses to and receiving return pulses from the ground station for range determination.

3.27 Test activity. The activity designated by the procuring activity to perform the preproduction or production flight tests

4. GENERAL REQUIREMENTS

4.1 General. The procedures described in this standard provide the information required to test airborne chaff payloads. The flight test, when conducted in accordance with the test procedures and test limits of this standard, will determine whether the chaff payload perform properly under normal flight operations and conditions, and conform to the specified performance requirements as delineated in the associated specification.

4.1.1 Associated specification and test plan. The procedures contained in this standard shall be supplemental to the performance requirements of the associated specification for the particular chaff payload, and by a detailed test plan prepared by the test activity.

4.2 Test plan. A test plan shall be prepared by the test activity to document information necessary to ensure standardized testing of a particular chaff payload. The information shall include, but not be limited to the following:

a. The type of aircraft, dispenser, and dispenser installation

b. The number of chaff samples to be measured and the number of aircraft passes (runs)

c. The rate at which chaff will be dispensed

d. The amount of chaff to be deployed on each run

e. The time after deployment at which measurements are to be made

f. The duration of each measurement

g. How the RCS data shall be processed

h. The minimum RCS requirement for the chaff payload

i. The flight profile including altitude, aspect angle relative to the measurement site, and calibrated airspeed.

The test plan shall contain all information and requirements which are peculiar to the test facility. In addition, the plan shall include pre-and post-flight radar calibration procedures (see 6.2).

4.3 Test facilities, instrumentation, aircraft, and dispenser installation. The test facilities, instrumentation, aircraft, and dispenser installation used to conduct preproduction, initial production, and production chaff measurements shall provide and maintain the test conditions as specified in the associated specification, the test plan, and as specified in sections 4 and 5 of this

standard. The test facilities, instrumentation, aircraft, and dispenser installations specified shall be limited to those which have yielded comparative data for at least three previous tests of the same chaff type, and have thereby established a data base for performance requirements. In addition, when a new facility or equipment is initiated, the data from the new facility or equipment shall be comparable to the existing baseline data. For individual chaff units, the three tests shall consist of a minimum of 30 units dispensed on each of the three test days; for continuous chaff, the three tests shall consist of a minimum of one roll, roll set, or roving chaff dispensed on each of three test days.

4.3.1 Number and types of radars. The types of radars used for preproduction, initial production, and production lot tests shall be as specified herein. The radar units shall have established data based general performance requirements as specified in 4.3. All measurements shall be accomplished while tracking aircraft at aspect angles of 5 degrees to 20 degrees. As a minimum, all chaff shall be evaluated using a 2-18 GHz SFR and 35 GHz radar. The data acquisition radars shall be slaved from a separate tracking radar if one of the data radars is not capable of tracking. Parallax correction between the data and tracking radar shall be employed (see figure 1). The data acquisition radars shall meet the following requirements.

a. The radars shall be equipped and specific parameters set in accordance with the associated specification and 4.3.1.1.

b. SFR specifications:

Parameter	E/F Band	G/H Band	I Band	J Band
Frequency	2-4 GHz	4-8 GHz	8-12.4 GHz	12.4-18 GHz
Min. Freq Coverage	2.05 to 3.75 GHZ	4.20 to 7.20 GHz	8.20 to 12.30 GHz	13.0 to 17.6 GHz
Req. Steps (GHz)(min)	0.10 to 0.15	0.2 to 0.4	0.2 to 0.5	0.6 to 1.0
Min. Freq Qty	13	11	9	7

PRF	150 pulses per frequency per second
Pulsewidth	0.5 μs
BandWidth	10.0 MHz
Polarization	horizontal

c. 35 GHz specifications:

Frequency	35 GHz ± 0.2 GHz
PRF	500 - 1000 Hz
Pulsewidth	0.25 μs
Bandwidth	10.0 MHz
Duty cycle	0.0008
Polarization	horizontal

4.3.1.1 Radar parameters. The effective radiated power of the radars shall provide for calibration on a sphere with a 10-to-1 signal-to-noise ratio and to make measurements on a one square meter target at the maximum drop range as specified in the detailed test plan. The radars shall have non-scanning antennas, stable power, and frequency characteristics.

4.3.2 Instrumentation. Instrumentation shall include equipment that shall measure and process RCS values for each radar pulse.

4.3.2.1 Measuring instrumentation. Measuring instrumentation shall meet the requirements detailed in 4.3.1 of the appendix of this standard.

4.3.2.2 Processing instrumentation. The data processing equipment shall provide the outputs and formats detailed in section 4.4.1 of the appendix of this standard and figures 3 through 6.

4.3.3 Aircraft and dispenser installation. The type(s) of aircraft and the location(s) of the dispensers shall be specified for any test. The type(s) of aircraft and dispenser location(s) used for testing preproduction, initial production, and production chaff shall have an established data base as described in 4.3.

4.4 Standard conditions. All airborne chaff measurements used for acceptance test shall comply with the test conditions as specified by this standard and the associated specification.

4.4.1 Weather. Unless otherwise specified in the associated specification, all flight tests shall be conducted with turbulence intensity not exceeding occasional light chop, as described in the DoD Flight Information Publication, with flight visibility of three statute miles or better, and cloud clearances of 1000 feet above, no clouds below the dispense altitude. In all cases, the weather shall be such that it will allow for flight under visual meteorological conditions (VMC). (See 6.2)

4.4.2 Aspect angle. The aspect angle, the angle between the actual boresight and the flight path, during the chaff measurements shall be between 5 and 20 degrees and shall not vary more than 8 degrees on any one test run.

4.4.3 Flight profile. The specific flight profile shall be as specified in the associated specification and in the test plan. The altitude shall be selected for ease in target acquisition and shall be compatible with the requirements of 4.4.2 and 4.4.4 of this standard.

4.4.4 Drop ranges. The ranges of the chaff from the measuring radars shall meet the aspect angle requirements of 4.4.2 and to ensure that a one square meter target shall be 10 dB above the minimum detectable signal level of the radar. The length of the drop zone shall provide for not less then 5-15 seconds of continuous chaff dispensing or provide for adequate spacing of discrete chaff units and ensure that 3-10 drops can be made on a single run.

4.4.5 Drop sequence. The drop sequence for discrete chaff units shall be chosen to ensure that no two consecutive chaff units may provide energy to one radar resolution cell during the time of measurements. Normally there are three or more full radar resolution cell spaces provided between successive chaff drops. The same spacing requirements shall be met for the pulsed mode of continuous chaff dispensers. Only one drop sequence per run shall be used for continuous chaff deployment.

4.5 Test documentation. Test documentation shall be prepared to record the results of each acceptance test. As a minimum, the test documentation shall contain:

a. Processed second level statistics of test data provided by the ground crew operator.

b. Pre-flight and post-flight calibration data.

c. Test data taken during testing. (4.5.1)

d. Chaff dispensing plan.

4.5.1 Test data. Test data taken at time of test shall include the aircraft flight profile including calibrated air speed; details on drop zones, drop spacings and drop sequences; characteristics of the radar; weather conditions; method of positioning the sample gates; spacing between the sample gates; and all other pertinent information delineated in the associated specification and test plan.

4.5.2 Chaff dispensing plan. A chaff dispensing plan shall be included in the test documentation, and describe the type of aircraft used, the dispenser location on the aircraft, complete information on the type of chaff payload being tested, and complete pre-and post flight information on the chaff payload. Figure 2 provides an example plan format which is recommended for guidance. However, all applicable block information shall be provided in plan.

4.6 Acceptance criteria. Acceptance criteria shall be as specified in section E of the contract, or as specified in the associated specification. Acceptance criteria shall include performance requirements for individual chaff units or for continuous chaff as applicable. For individual chaff units, acceptance criteria shall be the average RCS for the frequency spectrum required during the time the chaff is in a specified radar resolution cell or cells in terms of position with respect to the deploying aircraft. Acceptance criteria for continuous chaff shall be as above, except that homogeneity of the chaff trail shall form a part of the acceptance criteria. Usually the position of the radar resolution cell used for acceptance measurements will be two seconds behind the dispensing aircraft; however, for break lock chaff, measurements shall be made closer to the aircraft with respect to time.

5. DETAILED REQUIREMENTS

5.1 Test method. The test method given in the appendix of this standard shall be used for measuring the RCS of preproduction, initial production, and production samples of airborne chaff payloads.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful but is not mandatory.)

6.1 Intended use. Chaff is military unique because it is used as an airborne expendable countermeasure to protect military aircraft from radio frequency threats. This standard is intended to provide a uniform test procedure to be followed in making RCS measurements of preproduction, initial production, and production lot chaff samples to ensure satisfactory performance of procured chaff when deployed for self-protection or saturation purposes in any combat or training operation.

6.2 Other applicable government document. The following other government document forms a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

Department of the Navy, Office of the Chief of Naval Operations

OPNAVINST 3710.7 - NATOPS General Flight and Operating Instructions

(Copies of the above publication is available from the Standardization Document Order Desk,

6.3 Subject term (key word) listing.

Airborne
Countermeasures

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

APPENDIX

TEST METHOD FOR MEASURING RADAR CROSS-SECTION (RCS) OF AIRBORNE DISPENSED CHAFF COUNTERMEASURE

1. SCOPE

1.1 Scope. The test procedures contained herein are for the purpose of providing uniform detailed instructions to be used in measuring the RCS of preproduction, initial production, and production lot samples of airborne chaff payloads. This appendix is a mandatory part of this standard. The information contained herein is intended for compliance.

2. APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

3. DEFINITIONS

The definitions in section 3 of this standard apply to this appendix.

4. GENERAL REQUIREMENTS

4.1 General. All measurements shall be made using conventional pulsed radars equipped with pulse-to-pulse RCS processing instrumentation and shall meet the requirements of 4.3.2 of the main body of this standard and 4.3.1 of this appendix.

4.2. Pre-test preparation.

4.2.1 Test data. Prior to initiation of any test, the appropriate information shall be entered in the chaff dispensing plan as described in 4.5 of the main body of this standard.

4.2.2 Instrumentation checks. The instrumentation checks shall verify that the recorded values of range, azimuth, elevation, and time are properly calibrated.

4.2.2.1 Radar checks. Prior to initiation of any test, the following checks shall be made and appropriate entries shall be made in the test data.

a. Power up and stabilize the radar.

b. Use standard procedures from the radar manuals to set operating frequencies and record those frequencies on the test data sheet.

c. Measure and, when necessary, adjust the PRFs and record on the test data sheet.

d. Measure system noise at each frequency.

e. Verify overall radar performance in accordance with the applicable radar manual.

4.2.3 Radar and instrumentation calibration. Calibrate the radars and instrumentation relative to one square meter using the radars and instrumentation calibration procedures.

4.2.3.1 Calibration for absolute RCS. Calibration for absolute RCS shall be performed prior to and following each test mission at each radar frequency at which measurements are being taken. Calibration for absolute RCS shall be made using a sphere of known size that is lofted by a balloon, dropped from an aircraft, or towed by an aircraft and a signal generator test to verify the sphere test results. If exception is authorized and measurements are taken using a corner reflector, flat plate, or Luneburg lens; the calibration procedures shall ensure that the effects of lobe structures in the reflector pattern are eliminated. The procedures contained in the operating manual for the processing equipment shall be followed during calibration, and the signal-to-noise ratio used for calibration purposes shall be maintained at +10 dB or greater.

4.2.4 Loading and verification of payload. Prior to loading, conduct a check on dispenser performance using the ground checkout procedures required for the type of aircraft and dispenser being used. If the dispenser pod is instrumented, ensure that all instrumentation is functioning properly. Using the procedures published in the dispensing equipment manual, load the payload in the amount specified in the associated specification for that particular chaff payload. Record the exact load and deployment sequence on the test data sheet or chaff dispensing plan. Conduct pre-mission ground check to ensure that the loading has been conducted in accordance with the loading requirements, test data sheet, test plan, and associated specification.

4.2.5 Control procedures. Central control of the test shall be from the ground radar installation using the standard ground-to-air communications equipment in use at the particular test facility. Commands for starting and stopping deployment of chaff and commands for correction to the flight path due to the presence of old chaff or other detrimental conditions shall be given by the test engineer at the test facility. All corrections to the flight path shall be noted in the test data.

4.2.6 Aircraft operation. The type of aircraft used to conduct the flight test shall be specified in the associated specification of the chaff payload being tested. The aircraft flight profile and weather conditions are included in 4.4 of the main body of this standard. Unless otherwise specified in the contract or associated specification, the aircraft shall be equipped with a radar beacon or reflective lens to be used as a target for the tracking radar.

4.2.7 Radar operation. The radars shall track the aircraft in the beacon mode or be slaved in both range and angle to a radar that is tracking in the beacon mode. In cases where beacon tracking cannot be done, range tracking shall be accomplished in the aided manual mode. The radar shall lock-on and track the aircraft on each run prior to the deployment of chaff. After the data system is initialized, chaff drops shall begin and the radar shall continue to track the aircraft in both angle and range. Except for measuring old chaff (chaff which has been deployed for more than a minute), data shall be taken only when the radar is locked on and tracking the deploying aircraft. The operation of the radar(s) shall be continuously monitored during the test to ensure that the radar is stable and within radar specification limits.

4.2.8 Other data. In addition to the RCS data, the azimuth and elevation angles from the radars and the time of day shall be recorded. Other data, such as the type of aircraft, type of chaff, type of radar, altitude, and calibrated airspeed shall be recorded at the beginning of each test mission and at such times as there is a change in any of these parameters. This data shall be recorded for permanent record.

4.3. Instrumentation.

4.3.1 Requirements for RCS instrumentation. The following requirements are provided for the RCS measurement instrumentation. These requirements shall be used to establish that the RCS instrumentation meets required specification limits to measure the performance of the chaff measurement techniques described herein.

a. Instantaneous Dynamic Range: 60 dB required, 80 dB desirable.

b. Operating Range: 0.3 to 65 nautical miles required, ranges out to 125 nautical miles desirable.

c. RCS accuracy: ± 1 dB.

d. Measurement (range) gates: 15 minimum.

e. Permanent Record: Disk.

f. Data output: Eight range gates in real time on chart recorders or other medium, with 15 range gates minimum in permanent records.

g. Data recorded: RCS in each range gate for each radar pulse. Range, time, azimuth, and elevation information at least four times per second.

h. Positioning of sample gates: Fixed or slaved to radar.

i. Gate spacing: 50 - 200 nsec.

j. IF frequency: To match the radar.

k. IF bandwidth: 10 MHz minimum.

4.3.2 Instrumentation operating procedures. The general operating procedures supplied with the RCS processor and other instrumentation shall be utilized. Additionally, the procedures of 4.3.2.1 or 4.3.2.2 of this appendix shall be used depending on the type of test being conducted as specified in the test plan or associated specification.

4.3.2.1 Procedures for collecting data on chaff immediately behind the aircraft. For those cases where the chaff is measured immediately behind the aircraft, the following sample procedures can be used:

a. Sample gate number 2 shall be used to track the aircraft. When a beacon track is available, the processor gates shall be slaved to the beacon range gate. Where a beacon track is not available, the operator shall choose either the radar slaved mode or processor track mode - whichever best meets the requirements.

b. A minimum of fifteen sample gates shall be used to collect RCS data. One gate shall be in front of the aircraft, one on the aircraft, and the remaining gates behind the aircraft. Data shall be taken at all gates starting within 2 ± 0.5 seconds before chaff is first deployed during a run and ending just about one second after the chaff has passed through the fifteenth gate.

4.3.2.2 Procedures for collecting data on old chaff. For those cases where measurements are made on old chaff, data shall be taken with the gates stationary and positioned over the chaff cloud. This may require repositioning the gates when the cloud is very long.

4.4. RCS data processing.

4.4.1 Required data processing. The RCS data on permanent storage shall be processed as follows for each test.

4.4.1.1 Select data. Data selection shall be performed by determining the time period when the chaff is in the radar resolution cell being measured and processing only these data. The shadow graph requirement of 4.4.1.2 of this appendix shall be used to aid in the selection of good data.

4.4.1.2 Shadow graph. Calculate and plot the shadow graph of first level statistics for discrete chaff units and continuous chaff trails in each of the sampling gates for 35 GHz and each radar band or band set from 2-18 GHz (see figure 3). The shadow graph processing technique depicts RCS as a function of time and shall be used to determine when the chaff is in the radar resolution cell being measured and to define the size of any significantly weak or strong points along the chaff cloud. Upon determination of data that meets these requirements, the pulse-to-pulse information shall be omitted or included in the first and second level data processing depending upon the performance requirements of the detailed specification sheet or purchase description for the applicable chaff type. The saturation level (solid black line) of the shadow graph shall be chosen such that no more than 15 percent of the pulses will be shown as saturated. The number of pulses per second that are printed on the shadow graph shall vary between 0 and 300 based upon the following sequence:

Radar PRF of 0 to 300 - every pulse
Radar PRF of 301 to 600 - alternate pulses
Radar PRF of 601 to 900 - every third pulse
Radar PRF of 901 to 1200 - every fourth pulse
Radar PRF of 1201 to 1500 - every fifth pulse
etc.

4.4.1.3 First level statistics. Calculate and print out or display the first level statistics of the RCS values for each of the discrete chaff units or samples of continuous chaff in each of the sampling gates (see figure 4). The first level statistics shall include: the average RCS values of all of the pulses processed in that test group; the standard deviation; the maximum RCS value for any pulse in that group; the minimum RCS value, the RCS value which was equaled or exceeded by 90 percent, 70 percent, 50 percent, 30 percent, and 10 percent of the pulses; and the number of pulses included in the group.

4.4.1.4 Second level statistics. Calculate and print out or display the second level statistics of RCS values for each type of discrete chaff unit or chaff sample that was tested under the same conditions (see figure 5). The statistics shall be the same as those listed in 4.4.1.3 of this appendix except that the inputs will be first level averages instead of the pulse-to-pulse RCS data.

4.4.1.5 Growth curve. Calculate and plot the chaff growth curve (the second level average RCS values in each of the sample gates, see figure 6).

4.4.2 Optional data processing. When required in the associated specification, or by the test engineer, the following data processing shall be performed.

4.4.2.1 First level statistics of selected sample gates. Plot the first level statistics of the RCS values for each discrete chaff unit or sample of continuous chaff for selected sample gates. The RCS value shall be plotted versus the percent of pulses that equaled or exceeded that RCS value. The RCS values shall be quantized and plotted in 0.3-dB steps, and the filtered results shall be plotted as a function of time.

4.4.2.2 Pulse-to-pulse RCS data. Print out or display the pulse-to-pulse RCS values.

4.4.2.3 First level changes in RCS values for selected sample gates. Plot the first level statistics of the changes in RCS values from pulse-to-pulse for each discrete chaff unit or sample of continuous chaff for selected sample gates. The changes in RCS values shall be plotted versus the percent of pulse pairs that equaled or exceeded that change in RCS value. The RCS values shall be quantized in approximately 0.3 dB steps.

4.4.2.4 Second level changes in RCS values. Calculate and print out or display the second level statistics of the changes in RCS values of the pulse-to-pulse RCS data.

4.4.2.5 Second level changes in RCS values for selected sample gates. Calculate and plot the second level statistics of the changes in RCS values from pulse-to-pulse for each discrete chaff unit or sample of continuous chaff for selected sample gates. These plots are identical to those of 4.4.2.3 in this appendix except they are the average of “N” first level plots, where the data for all “N” plots were taken under the same conditions.

4.4.3 Data processing. After the test is completed, the data shall be processed using on-site data processing equipment. As a minimum, the following outputs shall be provided:

a. A printout of first level statistics as specified in 4.4.1.3 of this appendix.

b. A printout of second level statistics as specified in 4.4.1.4 of this appendix.

c. A plot of the shadow graph for chaff as specified in 4.4.1.2 of this appendix.

4.4.3.1 Data formats. The formats for the data listed in 4.4.3a through c. above are shown in figures 4 through 6. In addition, the data may be processed in any or all of the other methods described in 4.4.2 of this appendix as required by the applicable associated specification of the chaff payload being tested.

4.4.3.2 Data retrieval. All processed data shall be coded for machine retrieval by any of the following parameters: type of aircraft, type of radar, type of chaff, manufacturer, test range, or date and type of test. Data retrieval codes are required.

4.4.3.2.1 Data retrieval codes. Data retrieval codes are provided or shall be generated so that archived data may be retrieved by the processing equipment operator when any combination of codes (radar, facility location, type of test, type of aircraft, type of chaff, chaff manufacturer, and date) are fed into the processor. Data retrieval codes shall be recorded prior to each flight test with the appropriate information as contained herein.

4.4.3.2.1.1 Retrieval codes. Retrieval codes shall include:

a. Radar codes

b. Location codes

c. Type of test codes

d. Aircraft codes

e. Target codes

f. Manufacturer codes

5. DETAILED REQUIREMENTS

This section not applicable to this appendix.

6. NOTES

This section not applicable to this appendix.

APPENDIX

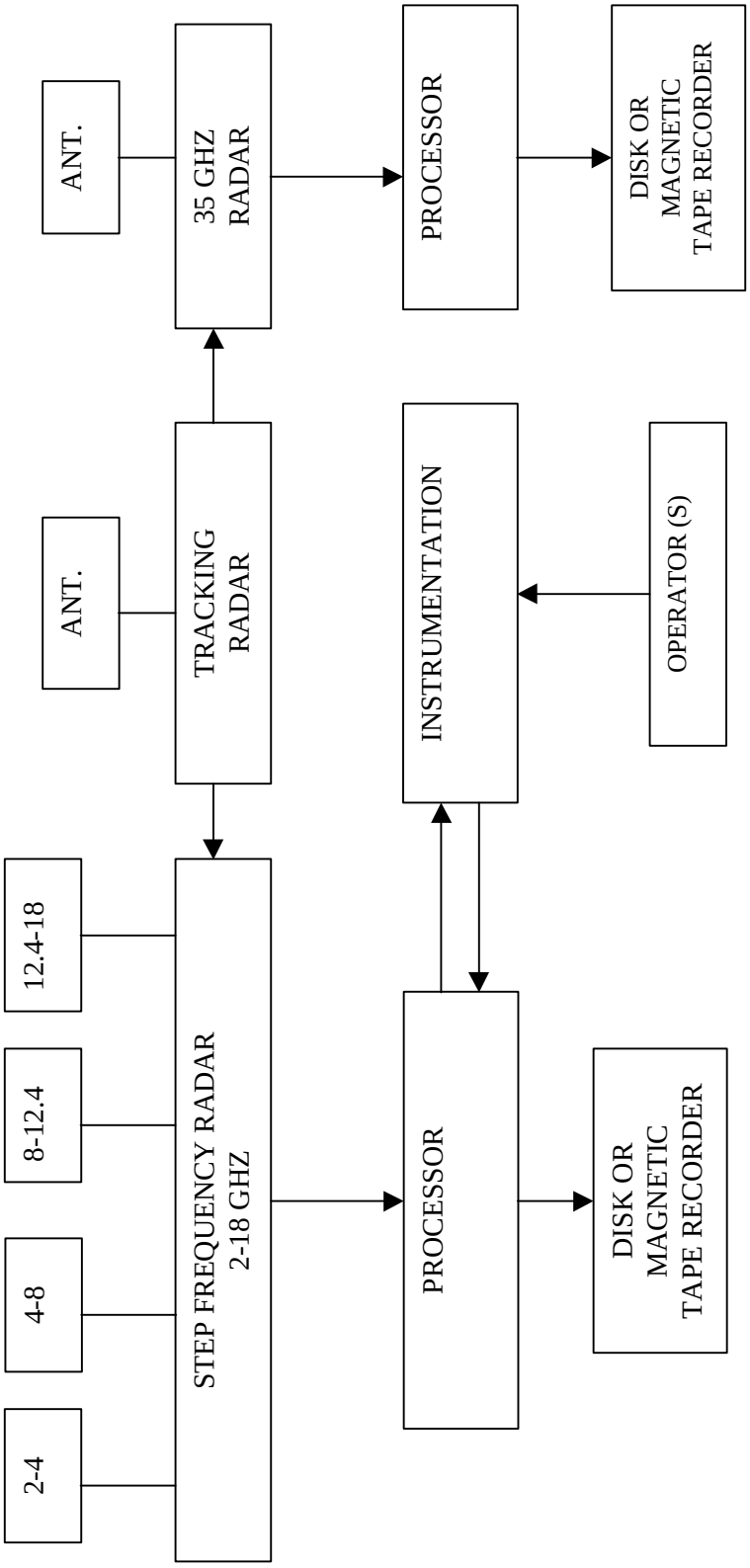
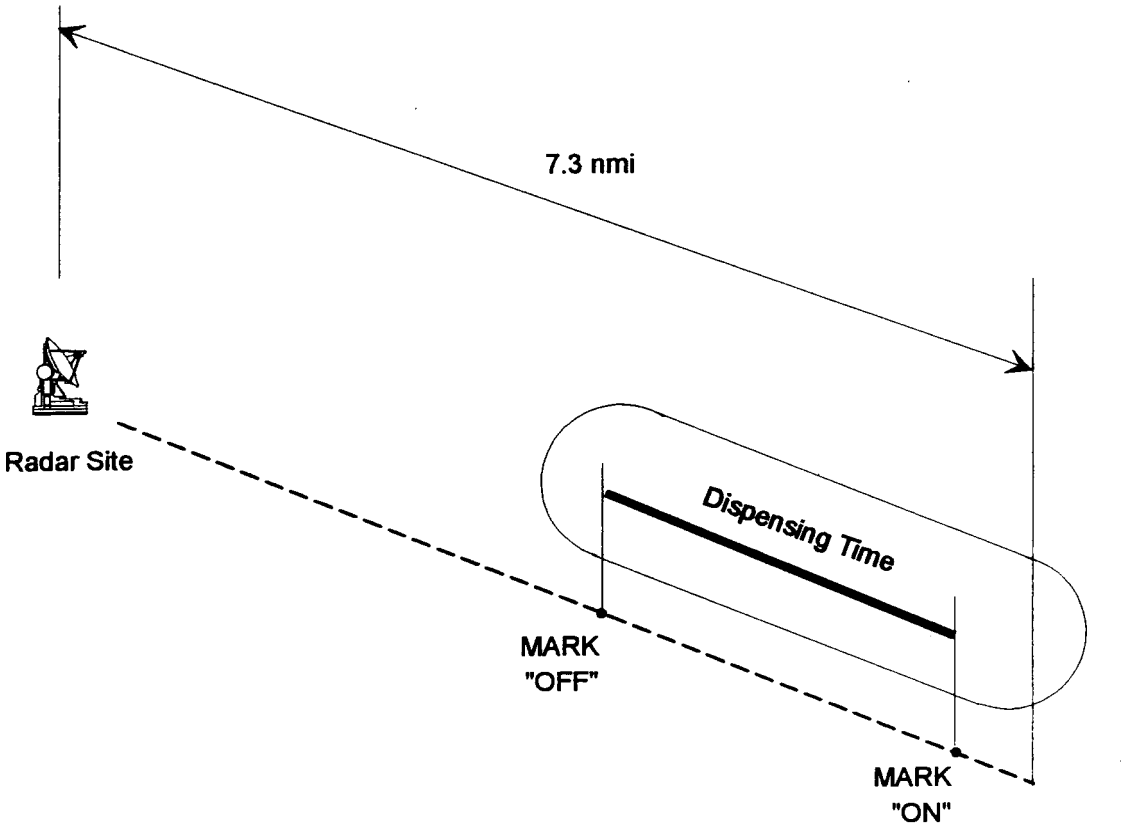


FIGURE 1. Example of data acquisition.

APPENDIX



MISSION DATA

MISSION NO.	
MISSION DATE	
AIRCRAFT TYPE/BUNO.	
CONTACT (Name/Phone No.)	

CONDITIONS

UHF freq.	
Altitude	
Airspeed	
Time of arrival	
Duration over test area	
Dispenser type	

FIGURE 2. Example of chaff dispensing plan.

30/09/96 D M Y 9630 MISSION	RANGE 01 VEHICLE 09 BUNO 442	VEH CLASS 01 VEH GROUP 01	CHECK RADAR FREQ POLAR	x x x x 27 08 02 03 01 13 01 02 16 15 02 02

RUN	TYPE	UNITS QTY PER	UNITS CUM RUN	INT SEC	TIMES FIRED	BURST SEQ BLNK = -	FLT PAT	CAM 1	CAM 2	CAM 3	REMARKS
0											
3001	A	8	8	1		8	X				
3002	B	8	16								
3003	B	8	24								
3004	B	8	32								
3005	B	8	40								
3006	B	8	48								
3007	B	8	56								
3008	B	8	64								
3009	B	8	72								
3010	B	8	80								
3011	B	8	88								
3012	B	8	96								
3013	B	8	104								
3014	B	8	112								
3015	B	8	120								
3016	B	8	128								
3017	B	8	136								
3018	B	8	144								
3019	B	8	152								
3020	A	8	160			8					
3021	B	5	180			5		x			QUADS
3022	B	5	200								QUADS
3023	B	5	220								QUADS
3024	B	5	240								QUADS
3025	A	5	260	1		5	X	x			QUADS

TYPE	MATL	TEST TYPE	CONTR	CONTR NO.	DISPENSER	LOT NO.
A	449	14	23	---	19	---
B	475	01	26	---	19	---
C						
D						
E						
G						

WEATHER DATA	START	END
COND.		
TEMP.		
HUMD.		
VIS.		
WINDS		

FLT PATTERN:

X OFF — ON (5.0K) — SB (5.5K)

FIGURE 2. Example of chaff dispensing plan – Continued.

APPENDIX

640AD Radar A

SOFTWARE VERSION-V2.01

RUN NUMBER = 29 DATE ACQUIRED: JUL 9, 1996 DATE PROCESSED: JUL 25, 1996
MISSION 9615 COHO HORIZ. SYSTEM 2
TPR 1511 MAT B

RADAR FREQ = 9100 MHz

RADAR PRP = 1000 usec RADAR PRF = 1000.0 Hz
GATE SPACING = 100 nsec FULL SCALE RCS = 0.010 square meter

PLOT INTERVAL = 20
STARTING PULSE = 800

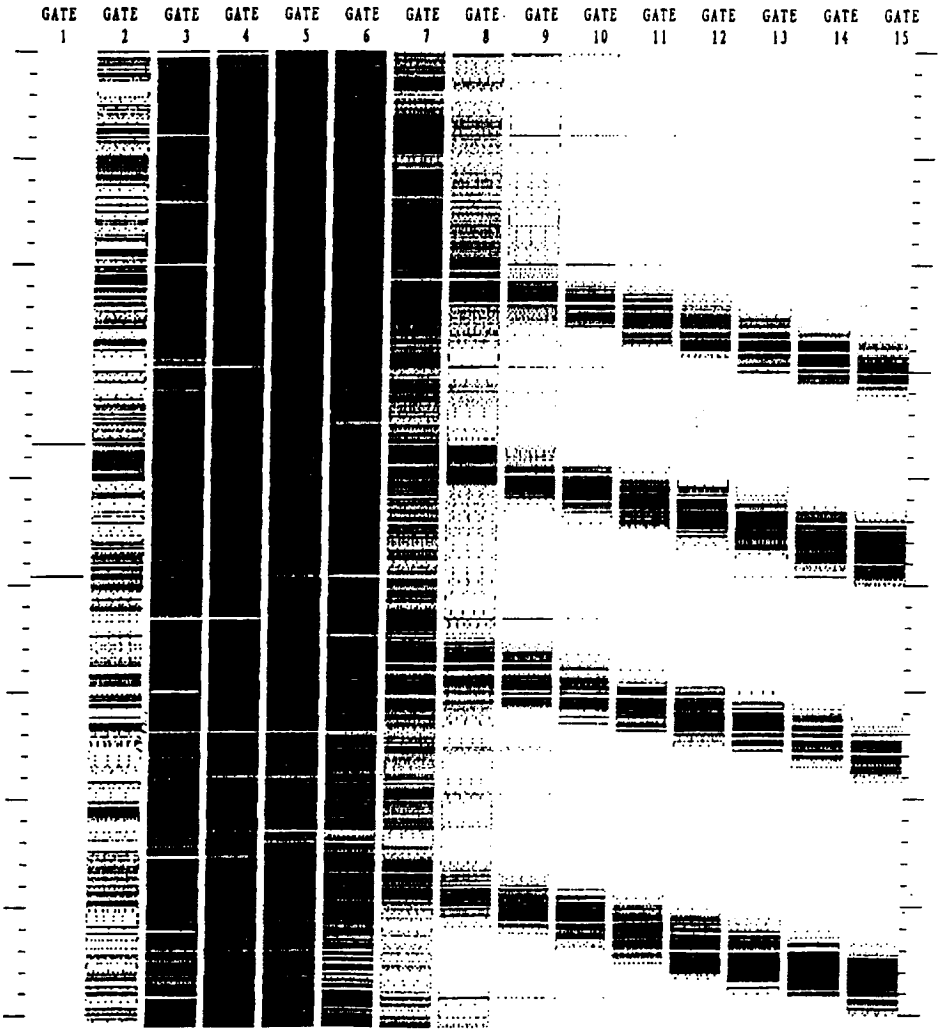


FIGURE 3. Example of shadow graph format in black and white.

Step Frequency Radar
Run Number = 3

Date Processed: Jul 9, 1996

Software Version V2.02
Date Acquired: Jul 9, 1996

NAVAIR MISSION 9615
RUN 1 - MAT A949 - BST SEQ 8

RADAR PRP = 6616 usec
GATE SPACING = 200 nsec

RADAR PRF = 151.2 Hz

AVERAGE RCS VS FREQUENCY (sq. m)

UNIT: 1

FREQUENCY GHZ	GATE 1	GATE 2	GATE 3	GATE 4	GATE 5	GATE 6	GATE 7	GATE 8	GATE 9	GATE 10	GATE 11	GATE 12	GATE 13	GATE 14	GATE 15	GATE 16
2.05EF					0.48	1.52	1.31	0.97	1.03	2.06	1.66	1.97	1.90	2.10	1.81	1.66
2.15EF					1.26	1.87	1.62	1.13	1.19	9.04	2.31	2.57	2.58	2.87	1.72	1.74
2.25EF					1.71	0.95	1.48	1.97	2.30	1.97	2.59	2.69	2.94	1.77	2.35	1.49
2.35EF					1.89	2.37	3.42	1.93	6.43	3.68	2.70	3.35	3.37	2.80	2.91	3.06
2.45EF					0.94	1.85	2.06	2.04	3.97	4.01	3.89	4.67	2.59	2.54	4.04	2.62
2.60EF					2.00	1.42	2.30	2.25	3.64	7.21	4.55	8.21	7.30	9.97	5.73	6.69
2.70EF					1.02	0.80	2.74	2.04	9.55	4.34	5.52	6.32	10.54	8.09	8.98	9.82
2.85EF					1.21	1.61	2.96	2.67	1.85	13.57	11.02	6.48	8.99	10.04	8.04	12.21
3.00EF					0.62	1.57	2.54	1.45	6.33	4.38	12.67	11.38	12.02	5.64	7.16	18.57
3.15EF					0.42	0.58	1.69	0.61	4.65	5.42	7.95	4.79	8.57	5.87	4.41	8.49
3.30EF					0.55	0.76	1.09	0.78	5.58	3.58	3.01	3.37	4.21	2.23	4.36	5.66
3.45EF					0.70	1.55	0.91	0.50	2.06	2.30	3.32	4.63	3.15	4.05	2.65	5.82
3.60EF					0.83	2.74	1.96	1.42	3.02	4.62	3.91	3.38	3.60	2.49	4.07	4.03
3.75EF					0.67	1.18	1.07	0.81	3.68	2.67	4.38	2.41	3.70	2.43	3.83	3.26
4.20GH					7.23	6.11	9.34	14.18	8.85	9.59	8.46	8.03	10.06	8.84	9.36	8.94

FIGURE 4. Example of first level statistics format.

FREQUENCY GHZ	GATE 1	GATE 2	GATE 3	GATE 4	GATE 5	GATE 6	GATE 7	GATE 8	GATE 9	GATE 10	GATE 11	GATE 12	GATE 13	GATE 14	GATE 15	GATE 16
4.40GH					8.58	11.01	8.60	14.96	21.67	7.84	6.73	9.92	9.46	8.52	8.32	8.07
4.60GH					4.16	10.31	8.31	14.11	6.79	8.30	5.18	9.04	9.73	7.01	7.12	8.30
4.90GH					6.88	16.18	8.06	16.21	8.67	7.35	7.66	9.24	7.57	7.11	7.17	9.78
5.10GH					8.80	8.12	11.98	12.53	9.43	6.14	10.94	7.11	8.15	10.10	6.73	11.50
5.40GH					12.57	21.12	15.69	22.17	8.65	12.17	6.46	13.90	19.81	11.76	8.33	11.71
5.70GH					9.11	19.00	16.20	16.65	5.17	9.28	12.08	15.86	12.73	12.60	11.67	18.01
5.90GH					14.37	12.63	13.58	15.44	6.83	9.36	5.42	12.64	12.56	10.70	13.90	14.91
6.20GH					7.13	12.82	8.10	12.52	7.84	8.50	5.12	8.15	5.51	6.65	5.00	9.18
6.60GH					4.19	9.83	8.29	5.86	3.79	5.28	5.79	4.96	7.02	5.34	8.52	9.82
6.90GH					4.37	6.85	7.57	7.20	2.74	6.28	5.29	5.86	8.61	3.92	5.35	5.71
7.20GH					3.70	5.02	6.15	9.30	8.07	5.26	5.43	6.48	6.30	5.05	5.91	4.77
8.20I					5.44	5.52	4.37	4.79	18.06	11.46	7.46	8.28	12.49	13.40	10.86	11.32
8.40I					4.08	3.74	2.67	3.95	6.09	9.71	12.45	10.44	14.09	11.52	12.17	13.84
8.80I					1.20	2.55	5.69	2.16	1.48	12.12	20.75	13.17	13.89	14.64	13.20	22.78
9.20I					2.28	1.45	4.66	2.86	7.41	10.85	15.04	16.14	15.00	15.74	14.81	22.14
9.70I					1.01	2.35	2.86	2.34	8.31	13.89	10.17	17.08	19.74	15.43	16.47	17.25
10.20I					2.91	2.42	5.15	3.26	4.84	8.76	15.35	12.45	13.54	19.76	15.10	14.17
10.70I					2.09	3.88	4.51	6.14	5.99	22.53	22.14	17.97	29.55	22.94	26.64	27.29
11.20I					4.64	2.99	6.89	8.39	13.23	10.53	7.88	11.39	17.32	16.51	11.20	10.08
11.80I					6.19	8.04	7.32	4.15	6.94	34.35	35.50	37.28	46.85	35.22	31.85	33.34
12.30I					2.61	2.69	4.02	4.51	3.54	5.55	7.58	9.90	9.02	12.16	9.50	12.26
13.00J					1.82	2.79	3.68	2.81	15.15	8.79	13.20	7.65	6.80	5.67	7.10	7.46
13.60J					8.39	8.37	9.36	7.60	10.94	12.19	10.79	10.70	9.46	13.98	11.92	13.62
14.30J					4.00	7.21	6.74	4.76	4.37	9.86	12.10	9.67	10.63	11.26	6.98	10.95
15.10J					3.43	4.03	4.09	2.96	10.72	5.60	10.03	6.41	8.29	7.03	7.33	7.08
15.80J					2.07	2.87	3.84	5.12	5.39	7.21	10.82	7.90	4.03	8.70	7.69	8.64
16.60J					4.11	9.15	4.89	3.92	6.22	8.38	12.74	7.31	10.49	15.24	8.29	8.77
1760J					6.46	7.60	8.22	10.33	4.21	11.57	12.33	12.33	10.38	9.96	12.31	10.66

FIGURE 4. Example of first level statistics format – Continued.

Step Frequency Radar

Software Version V2.02

Combined Files Data: tracor production lot no. 012

FSFR0000.004Run 5 NAVAIR MISSION 961RUN2 - MAT B966 - B 7/09/96 Extend Unit 8 Units
FSFR0000.006Run 7 NAVAIR MISSION 961RUN3 - MAT B966 - B 7/09/96 Extend Unit 8 Units
FSFR0000.008Run 9 NAVAIR MISSION 961RUN4 - MAT B966 - B 7/09/96 Extend Unit 8 Units
FSFR0000.010Run 11 NAVAIR MISSION 961RUN5 - MAT B966 - B 7/09/96 Extend Unit 8 Units

AVERAGE RCS VS FREQUENCY (sq.m)

FREQUENCY GHz	#	AVG GATE (7-10)	SUM GATE (7-10)	GATE 1	GATE 2	GATE 3	GATE 4	GATE 5	GATE 6	GATE 7	GATE 8	GATE 9	GATE 10	GATE 11	GATE 12	GATE 13	GATE 14	GATE 15	GATE 16
2.050	32	1.550	6.199					1.83	1.58	2.50	1.25	1.19	1.25	1.44	1.14	1.25	1.37	1.39	1.54
2.150	32	4.307	17.23					1.98	2.18	5.64	7.36	2.30	1.94	7.53	3.59	4.63	3.02	2.73	2.17
2.250	32	2.427	9.708					13.33	2.42	2.27	2.41	2.42	2.61	2.78	2.26	3.33	5.12	2.98	2.17
2.350	32	6.445	25.78					6.79	6.04	6.56	6.30	6.27	6.65	6.34	7.16	6.63	7.19	7.36	6.65
2.450	32	3.229	12.92					2.43	2.62	2.77	3.30	3.27	3.57	3.27	3.55	3.65	3.52	3.98	4.25
2.600	32	4.508	18.03					3.65	3.95	3.86	4.23	4.81	5.14	5.24	6.05	6.26	6.51	7.10	6.41
2.700	32	5.587	22.35					3.46	3.98	4.52	5.65	5.79	6.39	6.67	7.62	8.60	8.05	9.54	9.87
2.850	32	8.640	34.56					4.32	5.61	6.55	8.27	9.07	10.67	10.53	11.86	13.54	12.97	15.13	15.43
3.000	32	7.388	29.55					3.85	5.39	5.88	6.92	7.88	8.87	8.93	9.95	11.15	10.16	12.43	12.98
3.150	32	5.704	22.81					3.59	3.89	4.76	5.28	5.88	6.89	7.37	7.69	8.28	9.61	9.31	9.40
3.300	32	3.650	14.60					2.69	2.91	3.15	3.44	3.75	4.26	4.45	5.12	5.03	4.53	4.82	5.22
3.450	32	3.170	12.68					2.39	2.55	2.69	2.97	3.50	3.52	3.88	3.67	3.81	4.09	3.87	4.21
3.600	32	2.880	11.44					2.57	2.38	2.59	2.88	2.92	3.05	3.58	3.28	3.66	3.76	3.91	3.76
3.750	32	2.578	10.31					2.17	2.25	2.14	2.55	2.70	2.93	2.94	2.96	3.17	3.06	3.67	3.29
4.200	32	5.463	21.85					4.81	5.30	4.97	5.60	5.42	5.86	5.82	6.55	6.51	6.61	6.86	7.32
4.400	32	5.586	22.34					4.85	5.41	5.19	5.60	5.58	5.97	10.86	17.04	10.26	6.70	5.87	5.73
4.600	32	5.360	21.44					4.77	5.03	5.18	5.40	5.37	5.49	5.71	5.78	5.92	5.68	6.12	5.86

FIGURE 5. Example of second level statistics data format.

FREQUENCY GHz	#	AVG GATE (7-10)	SUM GATE (7-10)	GATE 1	GATE 2	GATE 3	GATE 4	GATE 5	GATE 6	GATE 7	GATE 8	GATE 9	GATE 10	GATE 11	GATE 12	GATE 13	GATE 14	GATE 15	GATE 16
4.900	32	5.636	22.54					4.32	5.16	4.96	5.96	5.84	5.79	6.42	6.23	12.30	6.87	6.61	7.15
5.100	32	5.970	23.88					3.94	4.70	5.05	6.03	6.32	6.48	6.57	6.84	6.88	7.12	7.68	7.67
5.400	32	7.201	28.81					4.46	5.68.	6.37	7.46	7.39	7.59	8.20	8.54	8.99	10.30	10.76	10.71
5.700	32	8.526	34.10					5.44	6.64	7.17	8.70	8.90	9.33	10.32	10.37	11.67	12.27	12.81	12.22
5.900	32	8.227	32.91					5.87	6.31	6.96	8.58	8.73	8:64	9.70	10.22	11.10	11.31	11.59	11.85
6.200	32	5.454	21.82					3.91	4.67	4.51	5.36	5.79	6.17	6.32	7.01	6.94	7.63	8.23	7.40
6.600	32	4.631	18.53					3.32	3.60	3.70	4.75	5.02	5.05	5.00	5.46	5.75	6.18	6.28	6.15
6.900	32	4.136	16.54					3.05	3.62	3.38	4.24	4.20	4.72	4.47	4.88	4.89	5.07	5.21	4.81
7.200	32	4.168	16.67					3.34	3.88	3.52	4.32	4.44	4.40	4.74	5.05	4.72	5.16	5.30	4.97
8.200	32	6.803	27.21					5.11	5.11	5.86	6.22	7.43	7.70	8.10	8.66	8.88	9.87	11.47	9.13
8.400	32	6.171	24.69					4.18	4.81	4.88	6.29	6.45	7.07	8.08	8.29	8.09	8.81	9.06	9.63
8.800	32	9.047	36.19					5.00	5.67	7.71	8.26	10.09	10.12	10.75	11.93	11.90	13.22	12.78	12.81
9.200	32	9.538	38.15					5.64	6.86	7.49	9.14	10.00	11.52	12.09	13.49	14.26	14.41	14.29	15.01
9.700	32	9.226	36.90					5.64	6.21	7.35	9.22	9.82	10.52	11.81	12.98	13.72	13.25	13.71	13.96
10.200	32	9.295	37.18					4.84	6.66	7.82	9.20	9.60	10.57	11.16	12.05	13.32	13.19	12.64	13.57
10.700	32	13.08	52.31					7.34	9.59	10.74	12.51	13.49	15.57	16.31	18.13	17.81	17.50	18.70	17.87
11.200	32	9.325	37.30					4.88	5.58	7.64	9.23	9.53	10.89	12.36	13.08	13.89	14.88	14.43	13.29
11.800	32	18.57	74.26					13.52	14.87	15.83	17.74	19.19	21.50	24.98	23.49	25.14	24.64	26.57	27.03
12.300	32	6.997	27.99					4.50	5.05	5.78	6.87	7.32	8.02	9.52	9.90	10.07	11.03	10.83	11.20
13.000	32	6.301	25.20					4.92	4.36	6.60	5.43	6.37	6.80	7.58	8.62	7.27	6.78	25.0	6.82
13.600	32	7.511	30.04					6.74	6.76	7.28	7.76	7.22	7.79	7.85	8.23	8.39	8.36	7.88	7.92
14.300	32	5.704	22.81					5.61	4.76	5.40	5.61	5.81	6.01	6.20	6.22	6.29	6.15	6.05	5.85
15.100	32	4.430	17.72					3.087	4.06	4.29	4.36	4.33	4.73	4.98	5.16	5.23	4.74	4.67	4.39
15.800	32	4.725	18.90					4.06	4.20	4.73	4.38	4.63	5.17	5.25	5.17	5.02	4.88	4.61	4.42
16.600	32	5.776	23.10					4.87	4.53	4.91	5.68	5.56	6.94	6.02	6.12	5.78	5.34	5.44	5.78
17.600	32	7.529	30.12					6.59	6.73	7.11	7.36	7.59	8.06	8.03	8.38	8.13	8.16	7.49	7.28
			UNIT SIZE 38					22	28	34	36	41	41	41	42	44	46	48	50

FIGURE 5. Example of second level statistics data format – Continued.

APPENDIX

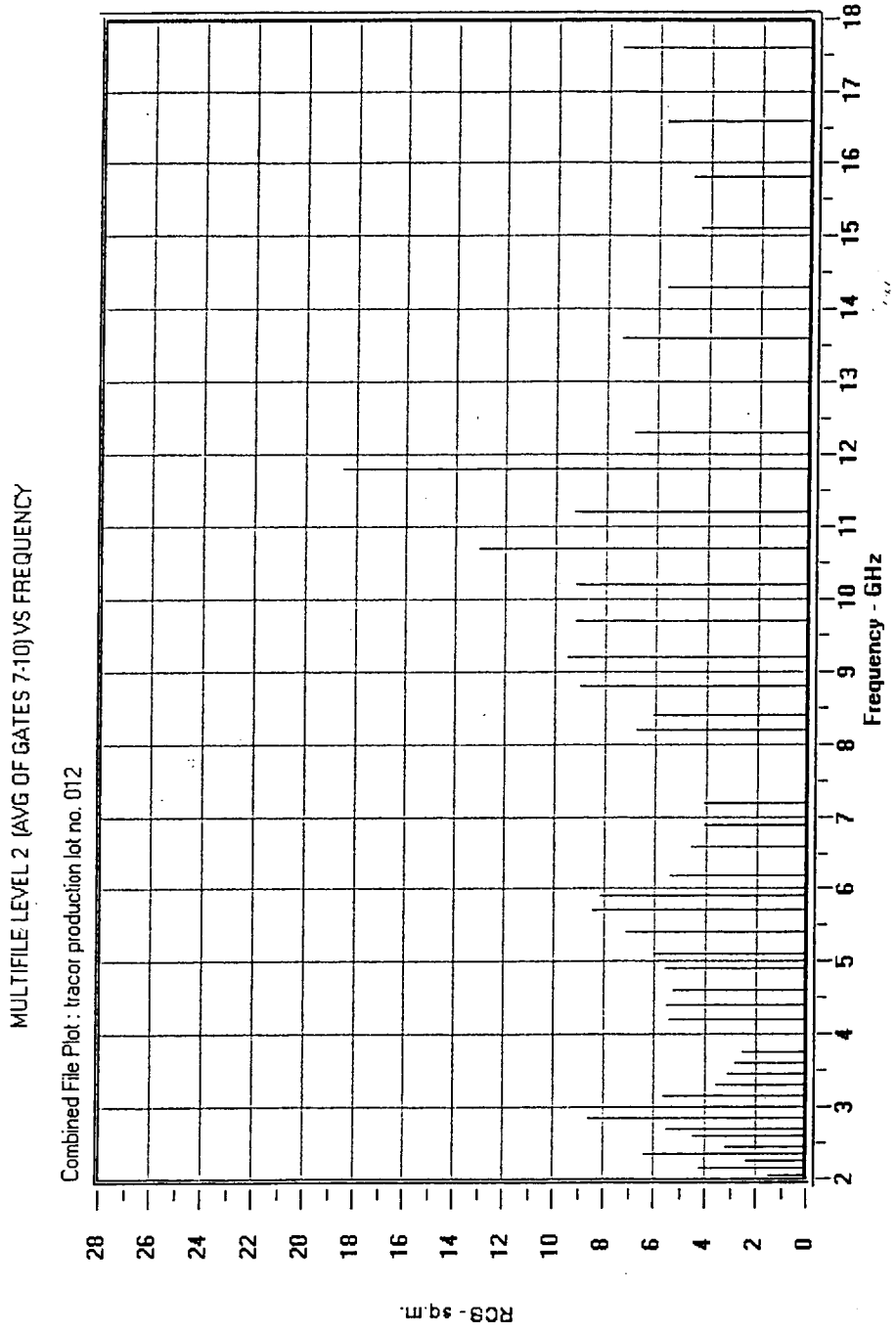


FIGURE 6. Example of second level growth curve data format.

MIL-STD-2071A(AS)

APPENDIX

CONCLUDING MATERIAL

Custodian:
Navy-AS

Preparing activity:
Navy-AS

(Project 5865-N118)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** MIL-STD-2071A(AS)	**2. DOCUMENT DATE** (*YYYYMMDD*) 20000428

3. DOCUMENT TITLE
TESTING OF CHAFF RADAR CROSS-SECTION

4. NATURE OF CHANGE (*Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.*)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (*Last, First, Middle Initial*)	b. ORGANIZATION	
c. ADDRESS (*Include ZIP Code*)	d. TELEPHONE (*Include Area Code*) (1) Commercial (2) DSN (*If applicable*)	**7. DATE SUBMITTED** (*YYYYMMDD*)

8. PREPARING ACTIVITY

a. NAME COMMANDER NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION	b. TELEPHONE (*Include Area Code*) (1) Commercial (732) 323-2947 (2) DSN 624-2947
c. ADDRESS (*Include ZIP Code*) CODE 414100B120-3 HIGHWAY 547 LAKEHURST, NJ 08733-5100	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703) 767-6888 DSN 427-6888