



AEROSPACE RECOMMENDED PRACTICE	ARP9013™/1	REV. A
	Issued 2005-10 Cancelled 2018-06	
	Superseded by AS9138	
Statistical Product Acceptance Requirements Using Isolated Lot Sampling Methods		

RATIONALE

This document is Cancelled and Superseded by AS9138. AS9138 is an upgrade and replacement for the Aerospace Recommended Practice (ARP) 9013-series of documents (i.e., ARP9013, ARP9013/1, ARP9013/2, ARP9013/3, ARP9013/4) prepared and published by the Americas Aerospace Quality Group (AAQG) in 2005. Technically equivalent standards are published in all International Aerospace Quality Group (IAQG) sectors (i.e., Americas, Asia-Pacific, Europe).

CANCELLATION NOTICE

This Technical Report has been declared "CANCELLED" as of June 2018 and has been superseded by AS9138. By this action, this document will remain listed in the respective index, if applicable. Cancelled Technical Reports are available from SAE.

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FOREWORD

To assure customer satisfaction, aerospace industry organizations shall produce, and continually improve, safe, reliable products that meet or exceed customer and regulatory authority requirements. The globalization of the aerospace industry, and the resulting diversity of regional/national requirements and expectations, has complicated this objective. End-product organizations face the challenge of assuring the quality of, and integrating, product purchased from suppliers throughout the world and at all levels within the supply chain. Aerospace suppliers and processors face the challenge of delivering product to multiple customers having varying quality expectations and requirements.

The aerospace industry established the International Aerospace Quality Group (IAQG) for the purpose of achieving significant improvements in quality and safety, and reductions in cost, throughout the value stream. This organization includes representation from aerospace companies in the Americas, Asia/Pacific, and Europe. This recommended practice has been prepared by the Americas Aerospace Quality Group (AAQG).

This document standardizes, to the greatest extent possible, the requirements on statistical techniques for acceptance of product in isolated lots in the aerospace industry. The establishment of common requirements, for use at all levels of the supply-chain, by organizations around the world, should result in improved quality and safety, and decreased costs due to the elimination or reduction of organization-unique requirements and the resultant variation inherent in these multiple expectations.

Where alternative statistical techniques are required for acceptance of product in isolated lots, other than those contained herein, they shall meet the requirements of ARP9013/4.

TABLE OF CONTENTS

FOREWORD..... 1

1. SCOPE 3

1.1 Purpose..... 3

1.2 Field of Application..... 3

2. REFERENCES..... 3

2.1 Applicable Documents 3

2.2 Related Publications 4

2.3 Definitions 4

3. REQUIREMENTS 4

3.1 Quality Parameters 4

3.2 Tables 4

APPENDIX A GUIDELINES AND RECOMMENDATIONS FOR SUCCESSFUL
IMPLEMENTATION..... 5

APPENDIX B REJECTABLE QUALITY LEVEL (RQL) QUALITY PARAMETER 7

1. SCOPE:

1.1 Purpose:

The purpose of this SAE Aerospace Recommended Practice (ARP) is to ensure conformance for each product characteristic being verified in a lot, without maintaining information from previous lots. ARP9013/1 specifies a product acceptance system for isolated lots. For example, isolated lot sampling avoids keeping track of the normal, tightened, and reduced levels of sampling formerly used in MIL-STD-105 and currently used in ANSI/ASQC Z1.4. Because those switching rules provided significant long-term protection for product quality, these isolated lot tables replace that protection in other ways.

1.2 Field of Application:

Inspection may sometimes be performed on an isolated lot, a few lots, or on stored lots at a time when production has been completed. Switching rules are not available to influence the quality. Isolated lot tables by themselves provide no method to reduce inspection costs for processes that prove to deliver consistently defect-free product. The incentive for using isolated lot sampling rather than sampling with switching rules is strictly to avoid the logistical costs of keeping track of what sampling level is applicable.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

- 2.1.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AS9100 Quality Management Systems - Aerospace - Requirements

ARP9013 Statistical Product Acceptance Requirements

- 2.1.2 ANSI/ASQC Publications: Available from the American Society for Quality (ASQ), 600 North Plankinton Avenue, Milwaukee, WI 53203, Tel: 800-248-1946 or 414-272-8575, www.asq.org.

ANSI/ASQC Q3 Sampling Procedures and Tables for Inspection of Isolated Lots by Attributes

ANSI/ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.2 Related Publications:

ISO 2859/2 "Sampling Plans Indexed by Limiting Quality (LQ) for Isolated Lot Inspection," may be obtained from any ISO Licensor's members or from the ISO Secretariat, Case Postale 56, 1211 Geneva 20, Switzerland.

2.3 Definitions:

See ARP9013 paragraph 2.3.

3. REQUIREMENTS:

Applicable requirements defined in ARP9013 shall be followed when using this specification document. This recommended practice provides additional requirements for accepting product in isolated lots. The following shall be in place at the organization's inspection facility:

3.1 Quality Parameters:

At least one of the following three points on the lot probability of acceptance OC curve shall be used as indices to choose isolated lot sampling plans: (1) the RQL; (2) the LQ; and/or (3) the indifference point or ERP. Implementing documentation shall specify which parameter is used as well as its value. The value claimed shall be statistically valid.

- 3.1.1 Lot Probability of Acceptance Operating Characteristic (OC) Curve: Calculations of isolated lot sampling probability of acceptance curves shall be based upon an appropriate distribution to reflect the limited quantities involved. Every plan shall show which quality parameter it achieves (RQL, LQ, or ERP), and that claim shall be statistically valid. The probability of acceptance shall be less than or equal to 50%. See Appendix A for further guidance.

3.2 Tables:

Tables that achieve specific values of ERP and RQL are included in this document for reference. See Appendices A and B.

Also see ANSI/ASQC Z1.4 where binomial and Poisson calculations are shown in ANSI/ASQC Z1.4 Table VII for the RQL, Table VI for the LQ, and Table X for the ERP; and these form ERP and acceptable approximations for the hypergeometric probability of acceptance.

PREPARED UNDER THE JURISDICTION OF
SAE COMMITTEE G-14, AMERICAS AEROSPACE QUALITY GROUP (AAQG)

APPENDIX A

GUIDELINES AND RECOMMENDATIONS FOR SUCCESSFUL IMPLEMENTATION

The paragraph numbering below is sequenced to follow the noted paragraph and requirements defined in Section 3 of this recommended practice. The guidelines in this appendix are considered nonmandatory and not subject to compliance audits, but are intended as an aid to the organization for better understanding of requirements, planning, and implementation of statistical product acceptance methods. This authorship of this recommended practice believes that following these recommendations to the extent possible will enhance the success of statistical applications that affect, improve, and maintain product quality.

A.1 GUIDELINE FOR 3.1.1 LOT PROBABILITY OF ACCEPTANCE OPERATING CHARACTERISTIC (OC) CURVE:

As an example, the hypergeometric distribution is recommended as an appropriate distribution to reflect the limited quantities involved.

A.2 GUIDELINE FOR 3.2 ERP TABLES:

EQUAL RISK POINT (ERP) QUALITY PARAMETER: These tables are recommended for the inspection of cost and appearance related features in isolated lots. Acceptance of any given lot requires that all inspected units in the sample conform to the specified acceptance requirement. Because nonconforming units can only come in whole numbers, any percentage nonconforming will be only approximate for most lot sizes; this table makes one set of discretionary choices about handling this issue, but any other statistically valid method may also be acceptable. These plans are not recommended for application to safety related features. See Table A1.