

OUTLINE OF WORKPACKAGES

1. Introduction

MICROREL offers the opportunity to establish a Partnership with a truly experienced and capable EEE Parts Procurement selection of Electronic Components and RF Microwave parts to Military Standards requirements specialized in parts component issues incorporating Parts Program Management and Parts Engineering experience specifically for the Space industry worldwide with a combination of capability, knowledge and experience.

MICROREL services are addressed to a large audience of Purchasing, Engineering and Management personnel who, although their jobs did not provide them day-to-day exposure to current theories and practices in the Design, Specification, Testing, Methods, Documentations of High Reliability EEE components, they do realize that some knowledge in these critical areas are essential to the efficient performance of their positions and their responsibilities.

2. Consulting services

The procurement of Electronic components for High Reliability applications requires a high degree of Engineering experience for Technical support to Designers and Managers to ensure compliance to the Project requirements through the correct component selection, requirements and Qualification steps and processes to the final delivery stage.

MICROREL offer a full turnkey parts procurement service from cradle to grave support, through BOM (Bill Of Materials) Review, Design support, Part Types selection/reduction, Obsolescence Management, Export License follow-ups, Procurement Specification preparation, Quality assessments, Part Evaluation Plans, Supplier Audits, Qualification Plans, Radiation sensitivity Assessments and Testing, Schedule control, Critical Part Management, CSI Customer Source Inspections through local Agents, Incoming inspection, Up-Screening/Upgrading, Alert tracking, PCN (Product Change Notice), DPA verification, Counterfeit detection, Long term Storage, Kitting/shipping, Failure Analysis and much more, however we are equally pleased to offer you the ability to access specific elements of our capability and experience and thereby acting in a true partnership.

To summarize **MICROREL** offers a very important advantage over all your existing Partners, we are the largest parts procurement management company and provider of technical services and parts to the international market place, as such your ideal partner for component related procurement.

WORK PACKAGE 1

Bill of Materials (BOM) Review

Upon receipt of your BOM, **MICROREL** parts engineers will perform a full review considering up to 40 different headed columns which includes:

- Specification
- Qualification
- screening level
- LAT
- up screen
- obsolescence
- Last Time Buy
- GIDEP & ESA alert
- long lead items
- Radiation
- RoHS / lead
- package to name a few

MICROREL has more than 30 years' experience in High Reliability Parts Engineering and it is this experience which forms the basis for our BOM review incorporating parts selection, alternatives and full details to support parts procurement.

Typically **MICROREL** would be prepared to provide a fixed price engineering effort against any provided BOM.

WORK PACKAGE 2

Parts Evaluation Plan

Having completed BOM review, non-standard or unqualified items may be selected for evaluation which can be performed in accordance with MIL/DSCC or ESCC requirements or customized to suit specific applications.

Typically evaluation will include: constructional analysis, radiation testing, manufacturer audit, screening summary or qualification life test.

In response to customer request, **MICROREL** would prepare an evaluation plan together with associated cost of performing the evaluation which can be presented to the customer for consideration.

MICROREL would be prepared to provide a fixed price engineering effort against any identified item either against a specific SOW or based upon a MICROREL BOM review.

WORK PACKAGE 3

Parts Radiation Plan

MICROREL utilizes a Radiation Test Database of more than 1000 radiation test reports and our engineers are very experienced in preparation of radiation plans, performance of test, analysis of results and final recommendations.

Radiation data can also be obtained through our network of JPL, GSFC, NASA, NGST, Aerospace Corp and many other manufacturer databases. **MICROREL** utilizes and has access to a number of radiation test facilities which include Northrop, JPL, RAD, Brookhaven, Texas A&M, etc.

MICROREL can perform the following types of radiation testing upon request:

- Total Ionizing Dose (TID)
- Enhanced Low Dose Rate (ELDRS)
- Displacement Damage
- Flash X-Ray
- EMP
- SEE-Single Event Effects
 - Heavy Ion testing
 - Proton Testing
 - Neutron testing
 - Gamma testing

MICROREL would be prepared to provide a fixed price radiation test against any identified item either against a specific SOW or based upon a **MICROREL** BOM review.

Pricing can vary by parts type, type of testing and availability of electrical test software.

WORK PACKAGE 4

Parts Specification Preparation

MICROREL has a library of over 1000 SCDs and more than 1700 up screen documents to meet high reliability requirements. Engineering Team is familiar with all standard specification formats which include ESCC, DSCC, NASA, GSFC, Military and customer formats. Upon request, MICROREL engineers can prepare a specification in any defined format with Prices.

WORK PACKAGE 5

Parts Qualification Plan

MICROREL has performed more than 300 independent qualification tests and upon request can prepare a qualification test plan following the format of recognised space standards or following customer SOW requirements.

Initially, an evaluation plan can be drawn up on the same basis as a procurement specification together with a fully costed test sequence. The cost is dependent upon part complexity and sample levels.

WORK PACKAGE 6

Supplier / Manufacturer Audit

Where Customer is considering a new Supplier or has experienced significant quality or schedule problems MICROREL engineers can be tasked to perform either a General Manufacturer Audit performed in accordance with either Space Agency Audit Standards or a bespoke Customer Audit Check List.

In cases where the Customer has experienced previous Quality or specific technical issues, MICROREL Engineers would review the Customer report and perform a targeted review of the manufacturers facility in preparation for the next procurement.

A typical charge for such a work Package would be based upon a per person / per day charge plus reasonable travel expenses.

The number of people performing the audit could be one or more depending on the complexity of the situation and customer expectations / requirements. This cost assumes use of a senior level component or quality assurance engineer.

WORK PACKAGE 7

Sub-Contractor Audit

Where Customer is considering a new Subcontractor or has experienced significant quality or schedule problems MICROREL engineers can be tasked to perform either a General Quality and Capabilities Audit performed in accordance with a Space Agency Audit Standards or a bespoke Customer Audit Check List.

In cases where the Customer has experienced previous Quality or specific technical issues, MICROREL Engineers would review the Customer report and perform a targeted review of the subcontractors facility in preparation for the next procurement.

MICROREL is both an experienced parts procurement agency and designer/manufacturer of advanced semiconductor solutions in multi-chip-modules, system- in-package, memory modules, including flash and solid state drives manufactured for the aerospace, space and high reliability market. This design and production experience and capability provide MICROREL with a unique extension to its parts procurement heritage and provides customers with access to a suite of qualified and experienced engineers who are familiar with a range of part and assembly technologies.

A typical charge for such a work Package would be based upon a per person / per day charge plus reasonable travel expenses.

The number of people performing the audit could be one or more depending on the complexity of the situation and customer expectations / requirements. However it may be the case that this can also be included within any overall assembly/system build contract to MICROREL. This cost assumes use of a senior level component or quality assurance engineer.

WORK PACKAGE 8

Sub-Contractor Management

In either the case where the Customer places an order directly on a Subcontractor, or alternatively places the Order directly on MICROREL for the supply of an equipment/subsystem MICROREL Management, Design and Technical support can be contracted to act on behalf of the Customer against an agreed Contract SOW and equipment Specification. Whereupon all aspects of the Subcontract can be managed by experienced and qualified personnel to assure the successful procurement of the Equipment/System.

A typical charge for such a work Package would be based against a Contract SOW and Specification as a fixed price or hourly rate.

Where visits to the supplier / manufacturer are required reasonable travel expenses will also be charged.

This service is especially popular and necessary where Customers are contracting ITAR sensitive Equipment's and where only US citizens are authorized to view or discuss details associated with ITAR products.

WORK PACKAGE 9

Test Witness (pre-cap, buy-off)

Where Customer is considering the performance of a Customer Source Inspection whether in-process or post assembly MICROREL engineers can be tasked to perform the Inspection in accordance with either Space Agency Standards or a bespoke Customer Specification. In those cases where the Customer has experienced previous Quality or specific technical issues, MICROREL Engineers would review the Customer report and perform a targeted Inspection of the Inspection Lot.

This is especially popular for ITAR controlled products.

A typical charge for such a work Package would be based upon a per person / per day charge plus reasonable travel expenses.

The number of people performing the inspection could be one or more depending on the complexity / quantity and customer expectations / requirements. This cost assumes use of a senior level component or quality assurance engineer.

WORK PACKAGE 10

Incoming Inspection

Where Customer is performing a parts procurement from a US Manufacturer and wishes to have an independent Incoming Inspection performed in order to clear the parts for onward shipment to Customer facility, MICROREL can offer full Incoming Inspection elements including:

- External Visual
- Electrical Measurement
- Data Review
- DPA
- Radiation Verification
- Quality Conformance testing

either against a Customer Source Inspection. MICROREL engineers can be tasked to perform the Inspection in accordance with either Space Agency Standards or a bespoke Customer Specification.

In cases where the Customer has experienced previous Quality or specific technical issues, MICROREL Engineers would review the Customer report and perform a targeted Inspection of the Inspection Lot.

This is especially popular for ITAR controlled products where the performance of the Incoming Inspection within the USA allow MICROREL to directly interface with Manufacturers management and engineering staff in the event of any problems, providing for a resolution of any problems prior to the shipment to European customers where ITAR restrictions would provide the customer with a very complex resolution without having access to a US parts procurement agency.

A typical charge for such a work Package would be based upon a hourly rate plus reasonable travel expenses, if applicable.

WORK PACKAGE 11

Export License Preparation and Submission

When a Customer is considering the parts procurement of an ITAR controlled part then MICROREL makes the ideal procurement partner since MICROREL has more than 34 years experience in procuring and delivering parts to a worldwide customer base including many thousands of export licences without having a license denied.

MICROREL employs a management and engineering team with experience in the preparation, submission, tracking and support of Export Licence approvals. Commonly MICROREL can complete the EL application and obtain approval within 2 -3 months with the average being closer to 2 months.

MICROREL also offers detailed management and technical monitoring of the manufacturers production, since under the conditions of ITAR regulations only US Citizens are authorised to view, discuss, receive and witness ITAR regulated parts production, consequently MICROREL is the only European CPPA with both experienced Management and Technical staff which are able to act on behalf of the customer and ensure a fully monitored procurement allowing customers to have the confidence that all elements of the procurement of Export Licensed parts are fully supported.

A typical charge for such a Work Package would be based upon the effort associated with the procurement and the cost of the procurement but is generally performed within the MICROREL management charge for the Item procured.

WORK PACKAGE 12

COTS/PEM (Plastic Packages) Screening

Where the customer is performing a parts procurement from a US Manufacturer and wishes to have an independent screening program performed in order to clear the parts for onward shipment to Customer facility MICROREL can offer full screening capability against a detailed specification or can prepare a specification against submitted SOW.

MICROREL SD engineers can be tasked to perform the Screening in accordance with either Space Agency Standards or a bespoke Customer Specification.

In cases where the Customer has experienced previous Quality or specific technical issues, MICROREL Engineers would review the Customer report and perform a targeted screening of the Inspection Lot.

A typical charge for such a work Package would be based upon a customer defined SOW and part type.

WORK PACKAGE 13

Counterfeit Parts Detection Service

Since the mid-2000s, the supply of counterfeit electronic devices has been dramatically increasing. Component counterfeiters are driven by profit potential. They are able to exploit current market conditions such as:

- Shrinking high-reliability product life cycles and long lead times
- Obsolete high-reliability components command high market prices
- Buyers under increasing pressure to reduce costs
- The steady flow of recycled electronic components
- 22% of counterfeit parts are sold by manufacturers or authorized distributors

How do they do it? They employ both simple and sophisticated methods:

- Recycled components sold as new parts
- Falsified certificates of compliance
- Commercial components re-marked as high-reliability components
- New components re-marked as obsolete components
- Re-marked components matching form but not function or reliability
- Buying genuine parts from manufacturers and authorized distributors, then “returning” counterfeits to get them into the legitimate market

MICROREL Counterfeit Parts Detection Service

- ✓ Streamlined extension to your internal risk mitigation processes
- ✓ Assurance that your parts are genuine
- ✓ Full documentation package provided with photos

AVAILABLE COUNTERFEIT SCREENING

- ✓ Visual inspection
- ✓ Marking permanency tests
- ✓ X-ray inspection (die presence, bond presence verification)
- ✓ Solderability
- ✓ X-ray fluorescence (XRF) of leads
- ✓ De-cap and die inspection (semiconductor components)
- ✓ Cross-sectioning (passive components)
- ✓ Electrical testing

BASIC SCREEN

- Visual inspection (100%)
- Marking permanency (sample)
- X-ray inspection (100%)

AS-NEEDED SCREENS

- Electrical testing (100% or sample)
- De-cap and die inspection (sample)
- XRF of leads (sample)
- Solderability (sample)