System X

In Service Support Plan

Support Solution

The CONTRACTOR SUPPORT Solution

This document details the Support solution selected by the Prime Contractor Team to support System X. It should be read in conjunction with the In Service Support Plan (ISSP) – Support Solution [Doc Ref: XXXXX] which provides details of the support assets, management and processes associated with the Support Solution.

The Support Solution benefits from an integrated Management, Planning and Logistics data system (MPLDS) and extensive Built-In-Test (BIT) resident across the constituent parts of the system.

Benefiting from an integrated tool set developed from proven commercial software products, the MPLDS functionality, integrated with the information available from the individual equipment, provides an accurate and essentially real time view of system and equipment performance across the deployment area. Add to this the ability to control the logistics process within this integrated environment and it can be seen the solution makes available both operational and support related information that can be used by the User community and the support community to maximise the operational effectiveness of System X.

The support solution has been developed concurrently with the mission system to ensure a fully integrated implementation including mission planning, performance monitoring and the logistics information/asset management.

In selecting a support solution the Prime Contractor has struck a balance between “traditional” Organic support and full Contractor Support. This balance is such that the vehicles, which are an integral part of the solution, will be maintained through the in-place service workshop facilities and communications will be maintained through the in-service support infrastructure. All other equipment is supported through the support programme.

The Prime Contractor has developed a set of relevant and measurable Key Performance Indicators (KPIs) that are used to monitor the delivery of service performance of the total support system. A Measure of Performance Indicator (MPI) has been established by combining a number of KPIs into the following relationship:

Utilisation/(TAT x Arisings)

This formula provides an indicator that determines the level of performance of service delivery and will be used to confirm that the support solution is operating effectively and thus, generate incentives for both the Customer and Prime Contractor to provide an effective, efficient and low risk support programme.

The support cost is derived from the utilisation information contained in the BFM and Utilisation Report [Doc Ref: XXXXXX]. It is structured as a fixed baseline price derived from a minimum utilisation figure and a per hour charge for utilisation above the baseline. This enables the user to accurately predict support costs against utilisation.

This document describes the monitoring and measurement aspects of the support solution and provides the background to the selection of the KPI and their relationship to the measurement of performance of the support solution.

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1 INTRODUCTION

The fundamental premise for the System X support solution is that:

It must be effective, efficient and low risk, and the resources required to fulfil the support requirements, including time, must be kept to a minimum.

The Prime Contractor will support System X through the execution of the Support programme that will take full advantage of the Management, Planning and Logistics Data System (MPLDS) capability to track and record equipment usage, operational condition and location.

The support programme start will be coincident with the Initial Operating Capability (IOC) and is planned to transition through the Full Operating Capability (FOC) milestone into the in-service phase.

The fundamental requirement for the successful implementation and execution of the support programme is a close working relationship (partnering) and understanding between the User and the Prime Contractor. The long term benefits of this support programme will be fully realised through an understanding and acceptance of common goals and aspirations by all involved parties.

The Prime Contractor has selected a support solution that strikes a balance between full Contractor led support and the more “traditional” Organic support, the balance being to conduct maintenance for the vehicles, other than first line, through the in-place “organic” capability and communications equipment maintenance through its in place support infrastructure.

Figure 1 illustrates the migration of support options from Organic to Contractor Owned and demonstrates how the responsibility for support system performance and the associated risks progressively changes when moving from one option to the other.

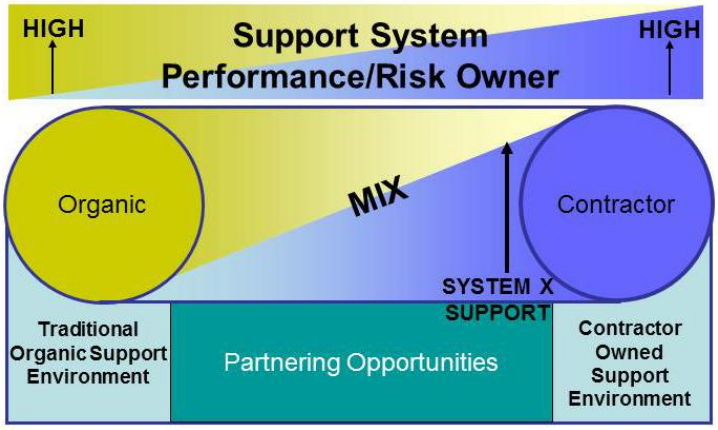

Figure 1: Support Solution Options

With a system as flexible and scalable as the solution for System X, the determination of performance parameters, the collection, collation and analysis of system usage/performance data and the system utilisation profile are critical parameters. However, of equal importance is an understanding by both parties of the responsibilities and dependencies, both individually and collectively, that will need to be in place to manage the support programme process and maximise its benefit.

1.1 Support Programme Initial Period

The appropriate infrastructure and support assets (see In Service Support Plan (ISSP) – Support Solution [Doc Ref: XXXXXX]) will be in place at IOC in order to support the

delivered mission equipment. The Initial Support Period will cover the IOC to FOC programme phase during which time support of System X assets will be conducted through a Prime Contractor managed support process. The Organisation for both the Prime Contractor and the User personnel will be established and agreed prior to the commencement of this initial support period.

KPIs have been established for the IOC to FOC period based upon the analysis undertaken during the Assessment Phase. These KPIs are detailed in Paragraph 6.8.

Combining the predicted equipment MTBF in conjunction with the delivery/turnaround-time and taking into account the delivery schedule and equipment utilisation has established the number of failure arisings that will occur during the IOC to FOC period and therefore the quantity of spares required to “prime” the supply chain.

To establish the parameters for the post FOC support phase a set of Key Performance Indicators (KPIs) have been established for the initial period. For system performance based KPIs these parameters have been derived from the detailed Reliability and Maintainability (R&M) analysis conducted during the Assessment Phase and the Support Life Cycle Cost (SLCC) Analysis. This identifies the support solution major cost drivers and therefore provides an indication of the areas that will require careful management and control.

Software Support, Training and Technical Publications all fall within the scope of the support solution. Accordingly the Software Support Plan, [Doc Ref: XXXXX] Training Plan, [Doc Ref: XXXXX] and the Publications Plan, [Doc Ref: XXXXX] have provided the basis for developing the KPIs for these disciplines.

In addition to the above the key reference documents that have been used to establish the measurable parameters are:

1) Battlefield Mission – [Doc Ref: XXXXX]
2) Utilisation Rate – [Doc Ref: XXXXX]
3) Deployment Scenario (Classified) – [Doc Ref: XXXXX]
4) Support Life Cycle Cost Analysis – [Doc Ref: XXXXX]

Establishing agreed and more importantly relevant and measurable KPIs is critical to the provision of a cost effective support programme. The modelling undertaken and recommendations made within this document are based upon the key reference documents identified above and reflect the System X mission and support systems that will be delivered by the Prime Contractor Team to satisfy the System X requirement.

2 ITERATIVE ASSESSMENT

The support solution will remain dynamic throughout the service life of System X. It is important that the performance of the support system is monitored and measured throughout the in-service life such that improvements can be made to enhance the system and reduce the Support Life Cycle Cost.

Figure 2 below illustrates the closed loop approach to reviewing the support solution and demonstrates the iterative support solution monitor, review, and improvement process that will be employed throughout the life cycle. Any improvements identified will be subject to both support life cycle and whole life cost analyses as a part of the process of further advancing the efficiency of the support solution.

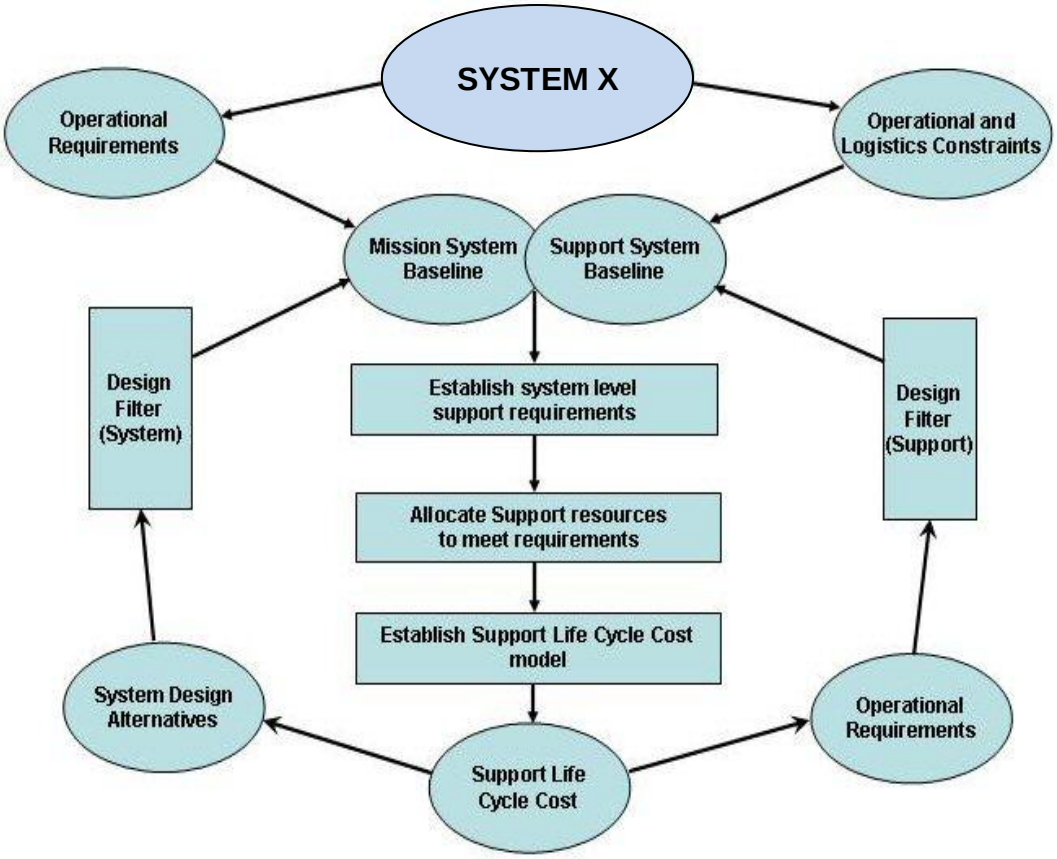

Figure 2: Iterative Support System Assessment

The following provides explanation of the terms used in the above Figure 2

- **Operational Requirements** - provided by the Customer containing both the technical performance parameters including, deployment, system performance requirements and top level ARM characteristics including availability and maintainability.
- **Operational and Logistics Constraints** - in the deployment of a new system there are many factors that will have influence including manpower, skills, facilities and infrastructure.
- **System Design Filter** - represents the technical pool of expertise about the system.
- **Support Designs Filter** - represents the technical pool of expertise about the support organisation and alternatives.
- **Mission System Baseline** - a description (at the Line Replaceable Unit (LRU) level) of the system with unit costs and demand rates – the Equipment Breakdown Structure plus associated costs and quantities. This description will be detailed enough to support the use of an analytical tool or programme.
- **Support System Baseline** - a description of the support infrastructure including stocking points, links, deployment and turn around times with sufficient to support the use of an analytical tool or programme.
- **Establish system level logistic support requirements** - the transformation of the operational requirements combined with the operational and logistics constraints into requirements that can be scoped and bounded including Reliability Allocation, Mean Down Time (MDT), Operational Availability and
- **Allocate logistic support resources to meet requirements** - the use of appropriate models for repair level analysis and sparing to assess the support solution that will fulfil the system level logistic support requirements and the relevant operational requirements. This will determine such attributes as manpower, facilities, test equipment, stock levels and locations.
- **Establish a Support Life Cycle Cost model** – iterate the configuration of the Support Life Cycle Cost (SLCC) model and run “what if” scenarios based on new input.
- **Support Life Cycle Cost** - calculate the SLCC. Not only is the total figure of interest but the relationship between the various cost elements is of immense interest as it provides the mechanism for identifying combinations of elements that effect the SLCC. Sensitivity analysis will identify the major cost drivers. Achievement of SLCC targets is the key factor and will fuel the support system improvement process.
- **System Design alternatives** - improvements in system design, for example a more reliable LRU, will update the system baseline.
- **Support System alternatives** - improvements in the support solution will update the Support System baseline.

3 CONTINUOUS IMPROVEMENT

In establishing the programme to support System X, and driving the performance and delivery of this service through measurement against KPIs, the Prime Contractor and the Customer/User will be incentivised to deliver continuous improvement of service, the key aspect of providing a consistent reduction in baseline support costs for System X.

The target is to demonstrate and deliver an annual reduction in baseline support costs over the in-service life of System X. This in turn reflects on all subcontractors and suppliers to the Prime Contractor and generates the motivation throughout the supply chain participants to improve their business performance through agreed incentives.

The support concept operates through the sharing of data and the agreement of performance parameters (KPIs) between the supplier, the procuring agency, and the user.

Responsibilities and dependencies fall on all parties in order that the support process can operate with maximum effectiveness throughout the service life of System X. Most importantly there are KPIs/performance targets for all major parties including the Customer/User and maximum benefit from the support solution will be gained if all parties embrace the fundamental aim of the process which is to continuously improve the delivery of the contracted service.

4 CONCEPT OF OPERATIONS (CONOPS)

In the support environment the Concept of Operations (CONOPS) is used to identify the usage parameters for the deployed system. Importantly these parameters set the baseline for the determination of the Key Performance Indicators (KPIs) against which the support contract will be agreed and the system will be assessed and monitored.

The support solution provided with this response is modelled and costed around:

1) Battlefield Mission – [Doc Ref: XXXXX]
2) Utilisation Rate – [Doc Ref: XXXXX]
3) Deployment Scenario – [Doc Ref: XXXXX]
4) Roles and Responsibilities – [Doc Ref: XXXXX]
5) Training Plan – [Doc Ref: XXXXX]

5 KEY ELEMENTS OF THE SUPPORT SOLUTION

- Core Services to be provided within the Support Contract are:
  - Help Desk/Technical Enquiries
  - Spares and repairs
  - Training delivery (to FOC) and core information management
  - Publications provision and update control
- System Utilisation profile – baseline operating parameters
- The Support Organisation and Customer organisational Structures – dependencies and responsibilities
- Contractual Matters and parameters
- Additional services that may be provided
  - Customer requested changes
  - Performance/Whole Life Cost improvements through new technology

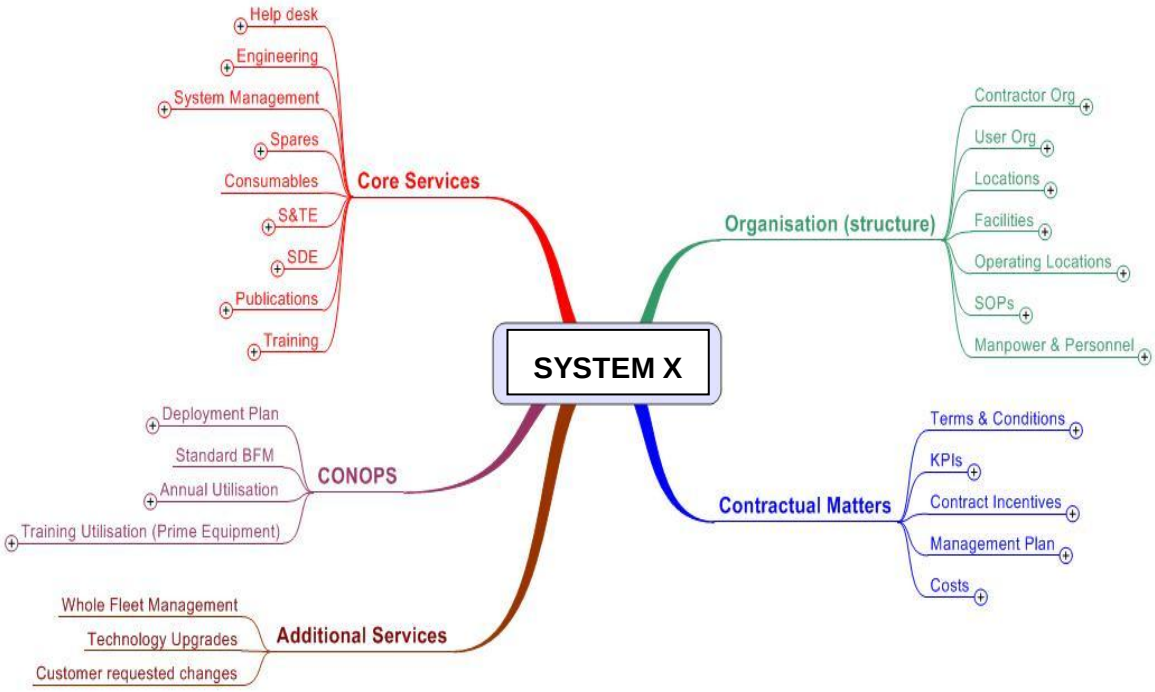

Figure 3: Support Elements

5.1 Services

In establishing the scope of the support solution the services offered are defined in terms of Core Services - i.e. within the Prime Contractor costs for conducting the Support Programme – and Additional Services which is the provision of services outside of the Core Services and which will be costed on a case-by-case basis and will be additional to the support costs. This definition will set the boundaries and constraints for the service to be offered. The Service elements are identified in the following paragraphs.

5.1.1 Core Services

The following services are included within the support solution:

- Contracted level of service
- Continuous data gathering, analysis, review and recommendation
- TLC analysis support through life
- Management of the support process, through life
- On-site support – personnel and infrastructure - through life
- Update and Delivery of Technical Documents
- Update and delivery of training material
- Support of training infrastructure
- Peace Support supply chain
- Refurbishment of identified area in Barracks
- On site facilities management
- Training delivery (conversion training)
- Failure definition – damage modes – sentencing committee support
- Spares provision and replenishment
- Supply of Consumables for specific System X equipment
- Repairs
- FRACAS
- Configuration Control
- Codification
- Provision of Subject Matter Experts
- Obsolescence management
- Technical enquiries
- Performance monitoring
- Defect and Failure investigations
- Through Life Disposal
- End of Life disposal

5.1.2 Additional Services

Additional Services are defined as those that will be carried out and funded outside of the Support Contract.

Including:

- Technology upgrades
- Customer Requested changes – hardware and software
- WLC instigated changes
- Whole Fleet Management

- Training delivery post FOC

5.2 Organisation

5.2.1 The Customer

Management interface and information flow are primary requirements of the Support Solution. In particular the initial period between IOC and FOC will be the time when the Customer to Prime Contractor relationship will be at its most important.

At the Support Programme management level the management and reporting links already established through the Assessment Phase and the early D&M Phase will continue. As the Project X programme transitions to production, delivery and fielding and active support commences, there will be additional interfaces between the Customer, the User and the Prime Contractor.

These interfaces will be fully detailed early in the D&M Phase and will include:

- Equipment Support Manager
- User Maintenance community
- User Operational community
- Commercial representatives – on-going support contract agreement
- The organisation for data monitoring and provision plus KPI and MPI validation

5.2.2 Prime Contractor

The Roles and Responsibilities of the Prime Contractor organisation are detailed within the ISSP – Support Solution [Doc Ref: XXXXXXXX]

6 SUPPORT CONTRACT IMPLEMENTATION

6.1 Introduction

Contractually the Support Programme will be initiated and monitored through a Service Level Agreement (SLA) that identifies the scope of responsibilities for all involved parties and defines performance targets.

The SLAs will be supported by a Statement of Work (SOW) that identifies the tasks required to fully implement and manage the Support Programme against the key elements identified in Figure . The Prime Contractor will agree a SLA with the Customer/User community that specifically identifies all of the requirements, parameters, responsibilities and exceptions that define the Support service to be provided. The scope and detail of this agreement provides the core requirements and operating parameters for the Prime Contractor to supplier SLAs that will fully support the deployed System X.

Performance monitoring is achieved through measurement against a set of agreed Key Performance Indicators (KPIs)

An initial SLA will be agreed and implemented in time for the commencement of the IOC programme milestone. The initial parameters have been determined and presented based upon the analysis and system development activities completed during the Assessment Phase and will be confirmed through subsequent activities during the D&M Phase. A progressive acceptance policy culminating in the Logistics Demonstration (Log Demo) will provide evidence of Support System capability and refine the requirements and resources necessary to support System X deployment at IOC.

6.1.1 Service Level Agreements

The Prime Contractor will agree a performance-based contract – Service Level Agreement (SLA) - with the Customer. Anchored in this contract will be the Measure of Performance Indicator (MPI) that will enable both parties to measure the progress of the System X programme and the success of the co-operation (partnering) between the Customer and the Prime Contractor.

Back-to-back contractual arrangements, manifested as Service Level Agreements (SLAs), will be agreed between the Prime Contractor and all Team members and suppliers. These SLAs will include flow down targets and incentives agreed at the prime contract level to all parties that comprise the Prime Contractor Team providing opportunity and incentive for improvements in service delivery and hence improved effectiveness and reduced baseline support cost.

At both Prime Contractor and sub-contractor level the KPIs are set jointly with the Customer and Prime Contractor and correspond to the scope of services covered in the appropriate contract and the requirements of the provision of support objectives.

Examples that are relevant across all contractual levels are:

- Equipment reliability
- System availability
- Response times
- Turn Around Time

Values for service based KPIs – response times, repair times, delivery times - have been initially set based upon available information from current monitoring and recording of business processes within each contracting organisation. Equipment and system based KPIs have been established using information including predictions, experience and field data as available. This has set the initial benchmark against which, the delivery of service defined in the Service Level Agreement, can be measured and reported. This initial benchmark reflects the current performance and capability of each participating organisation and will be confirmed by all relevant parties during the D&M Phase programme.

In support of this approach sub-contractors and suppliers have provided information including turn around time, surge capability, repair times, MTBF, maintenance times and delivery/lead times to the Prime Contractor. This has provided the base data from which the initial KPIs, that will be included within the Support SLA and that are detailed in this document, have been set. This data is the basis for the KPIs that have been included within the Prime Contractor to supplier SLAs. This sets the baseline values and measurement parameters for the performance management processes that will be used throughout the Support delivery programme with the benchmark that provides the comparison reference.

6.1.2 Customer

An example SLA is included as Annex A to this document

6.1.3 Supplier

Draft Service Level Agreements (SLAs) are in place with all Prime Contractor suppliers and these agreements provide confidence in the minimum stock, replace and repair policy and specify the parameters against which the support process can be measured.

The fundamentals of the agreements are a flow down of the spirit of the Customer SLA an example of which is provided as Annex A to this document.

Key points are:

- Minimise stock in support chain
- Level of support to be consistent with delivered assets
- Obsolescence management
- Acceptance and Measurement of KPIs

6.2 Cost versus Utilisation

System utilisation varies significantly throughout the three year readiness cycle identified in the BFM and Utilisation Paper, [Document Ref: XXXXX]. The typical method of calculating the cost of supporting military systems has been to look at the

likely utilisation, predict failure arising rate from MTBF information, calculate repair costs and use turnaround time to estimate pipeline spares. Experience suggests that this method of conducting the business of support does not provide the best value. Taking into account the normal “two years provisioning spares” significant funds are allocated against system support with little incentive to provide more efficient and effective methods of delivering that support.

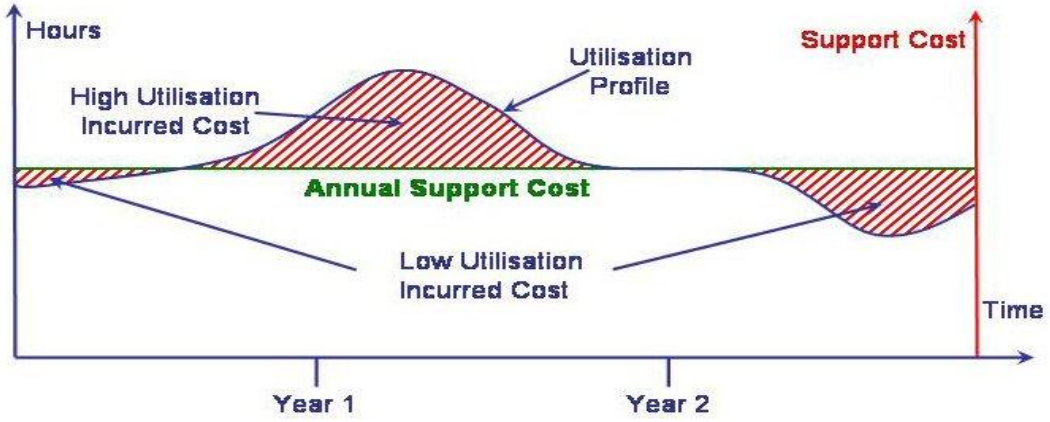

Figure 4: Traditional Support Charges

Generally the support cost figure is based on a normalised utilisation rate that is significantly higher than the minimum annual hours run for the system. The User is therefore charged for utilisation which is below the normalised figure and when utilisation is in excess of the agreed figure. This method may be cost effective if the range of annual utilisation is relatively narrow, predictable and consistent over the in service or contract period. If however there is a relatively large variance of utilisation this method of contracting can become very expensive. Figure 4 illustrates the “traditional” approach.

The Prime Contractor has reviewed the approach to support and has settled on maximising the advantages of the minimal stock policy and the inherent data capture capabilities of the MPLDS. System X data collection capabilities provide performance feedback not only of the equipment but also of the support system including the transit time and turnaround time for assets moving in and out of the deployment area.

6.2.1 Hourly Charge

Accurate data regarding system performance and equipment utilisation is available, real time, from within System X. The support solution will be contracted through an agreed hourly rate the initial value of which has been derived from the analysis and data available at the end of the Assessment Phase. This value will be reviewed throughout the initial support period and throughout the supported life of the System X equipment.

Figure demonstrates the principal of contracting against an hourly cost and illustrates that once again there is a minimum number of hours annually that the system should be exercised. Below this figure the User is funding the support infrastructure without the benefit of using the system.

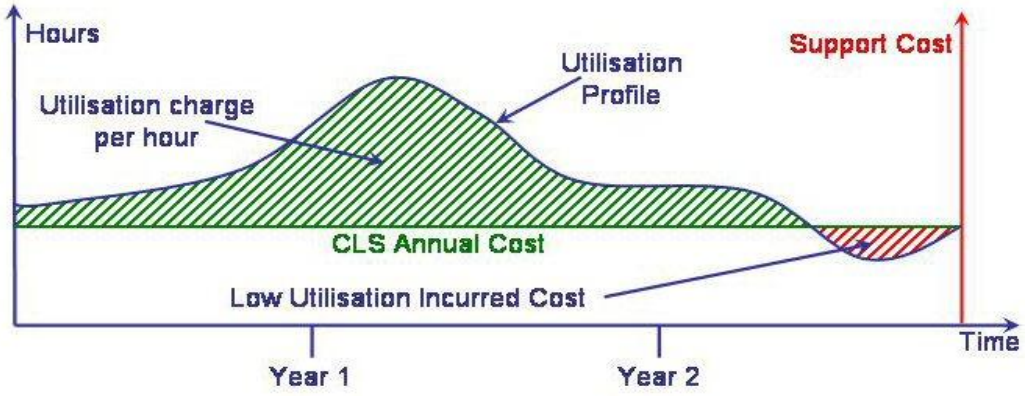

Figure 5: Hourly Rate

In identifying an hourly cost for System X support there are a number of parameters that reflect on the ability of the system to meet its performance requirements. The Prime Contractor fully appreciates that these contributors are measurable and are critical to ensuring that the system is capable of operating when required by the User.

It is these key contributors, monitors and measures or Key Performance Indicators (KPIs) that will demonstrate to all concerned parties the actual performance of the support system and the System X equipment.

6.3 Selection of KPIs

Well defined and consistently measured KPIs will provide invaluable information regarding the performance of equipment and services. KPIs have been established against clearly defined service level agreements and targets that are achievable whilst challenging. By linking KPIs with an equitable payment mechanism the excellent performance of the support organisation can be rewarded and equally penalties can be implemented where performance falls below the agreed limits.

The Prime Contractor has not considered individual KPIs in isolation, and where a specific performance measure may result in, or be the result of poor performance in another performance measure; these measures are linked to facilitate the realistic reflection of the performance achievements. For example, failure to complete preventive maintenance (PM) activities will lead to a greater number of system faults and hence an increase in corrective maintenance actions. The Prime Contractor will link these two measurable KPIs such that any trends can be identified at the earliest stage and necessary action planned, agreed and implemented.

In this example the reason for the PM tasks not being completed could be attributed to poorly defined preventive maintenance frequency and actions, insufficient details on frequency of task, or insufficient training or supervision being provided. This simple example illustrates how an identified trend – increased corrective maintenance – can effect or be affected by a number of other measurable parameters.

The Prime Contractor has investigated the relationship, of the identified KPIs and will further refine these links and the scope and targets for the KPIs as the D&M Phase progresses.

Using the same data that serves many other purposes within the Prime Contractor organisation as a basis, is actually part of forging great organisational synergy and is much more effective for facilitating communication. Under the notion that "what you don't measure, you don't improve," these KPIs will be measured with data that is clean, updated, shared, integrated, has a historical perspective and has widespread buy-in at all management and participant levels.

Areas considered include:

1) External

- **User-Facing Metrics** Equipment performance, payment preferences, Help Desk/Tech Enquiry centre utilisation, arisings and returns, customer satisfaction, warranty work, No Fault Found, .repair times, maintenance times

2) Internal

- **Procurement** Lead times, on-time performance metrics, costs, supplier management, quality management, supplier improvement plans
- **Supply Chain** Turnaround times, supply chain costs, transport costs, capacity, transit times – into and out of theatre.
- **Productivity** Inventory levels, waiting time, employee productivity, labour costs, yield.

The rationale for the selection of the KPIs identified in this document is provided as Annex B to this document.

6.4 KPI Definition

The flexibility, capability and resilience that the support solution provides, necessitates detailed analysis of the parameters that will become the defined KPIs. In defining the KPIs a logical approach has been used to firstly understand the “CONOPS”, Concept of Operation, of the deployed system and then to establish sensible, measurable parameters. Further the separation of External and Internal KPIs is important from the visibility and contractual viewpoint.

Initially consideration was given to using Operational Availability (Ao) as the primary payment metric and in a broad sense that is the approach being adopting. However Ao is based around Mission Critical failures and not individual equipment or process performance.

Further the deployment configuration will affect the Ao figure. The layout of the system assets, the amount of equipment employed, the number of users at each location and the utilisation of the system are all contributors to Ao. Each different deployment will result in different Ao contributors and hence a different Ao figure. This simple example illustrates the need to identify a series of complimentary metrics and measurement criterion that truly reflect System X and equipment performance, together with that of the supporting disciplines. The management of collected data, and the analysis of associated KPIs, is critical to identifying trends and effecting improvements in the support infrastructure.

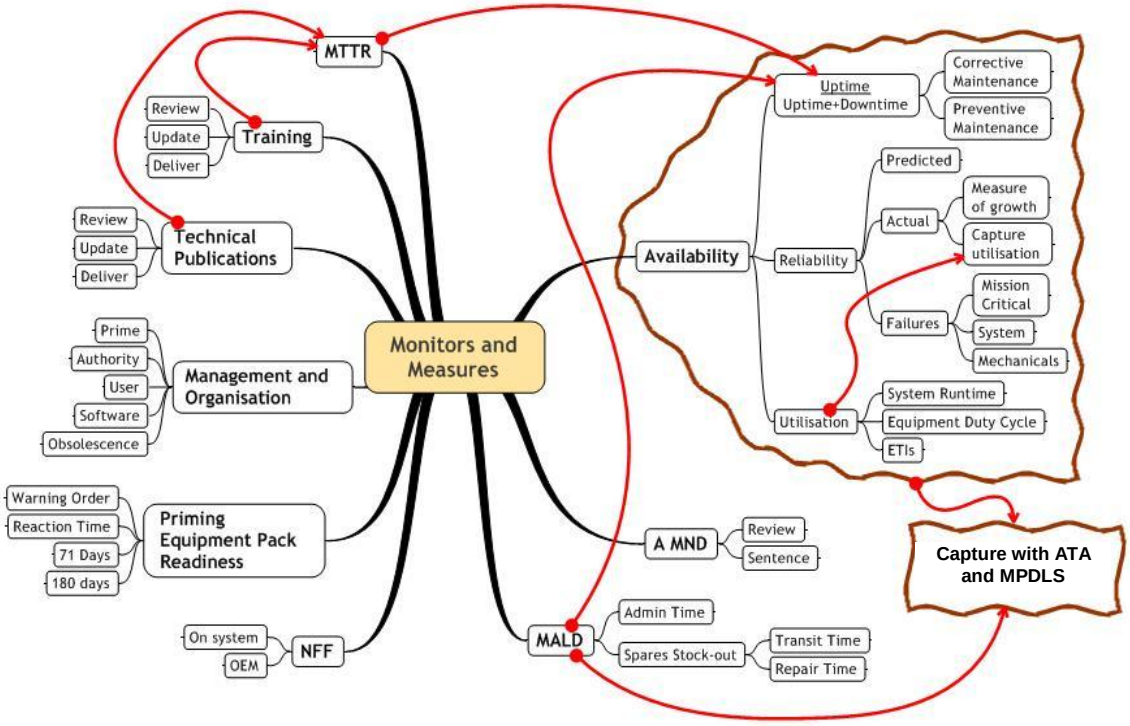

Figure 6: Monitors and Measures

To establish the set of measurable KPIs the Prime Contractor has determined the key parameters that contribute to the system being available for use and investigated these to determine their applicability to the performance of the system and the method of data capture and subsequent measurement. Parameters that determine the performance of the support infrastructure are identified and are an integral part of determining the performance of the support system. Figure 6 identifies the range of measurable parameters that have been considered in developing this support solution and identifies examples of links between them that demonstrate the dependent nature of these parameters.

6.5 Contractual Key Performance Indicators

The Support Solution is reliant upon close co-operation (partnering) between the Prime Contractor and the User. Accordingly there are dependencies on both parties and measurements of performance that need to take place for infrastructure performance as well as equipment technical performance.

Figure illustrates the identified key contributors that underpin the pay by the hour approach and will be used to determine the performance and identify trends within the support solution and the equipment.

To provide a performance monitor and a method of tracking trends, identifying problems and setting benchmarks all contributors are deemed as KPIs and are described in more detail in Paragraph 6.8.

In reducing the contracted payment to pay per hour there are associated performance measures that will be jointly viewed by both parties to ensure the system is performing within its agreed limits. This provides visibility to the key performance aspects of the support solution together with that of the equipment.

Many disciplines contribute to the provision of service provided under the support programme. There are performance measurements concerned with administration and management, equipment performance and external services all of which will be monitored throughout the in-service phase. Figure illustrates the key measurement criteria that will be used during the programme. The distinction made is between the measurements used internally, and shown in blue, to monitor the management and performance of the Prime Contractor team and the joint dependencies; and those that contribute directly to the formulation of the Measurement of Performance Indicator, (shown in yellow).

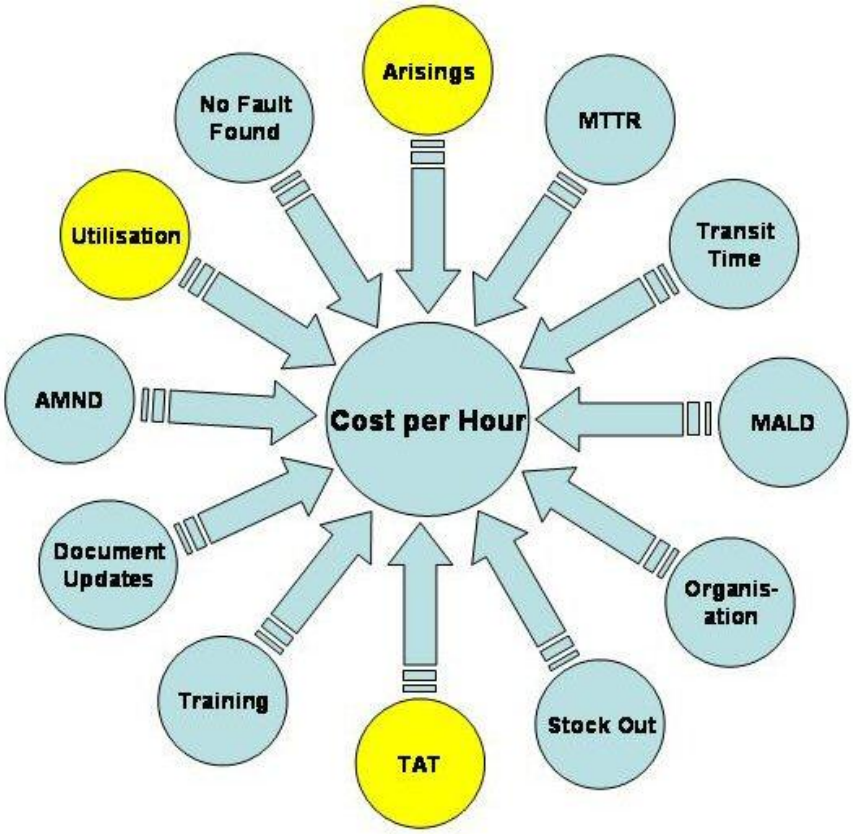

Figure 7: Measurement KPIs

The chosen KPIs can be readily measured and provide a view across the support services. As has already been stated the KPIs do not stand alone and later paragraphs detail the characteristics of the External and Internal KPIs and provide the initial and target values against which performance will be measured.

Each KPI definition includes information on the links that exist to other KPIs and how the relationship is formed and the direction of influence.

6.6 Measure of Performance Indicator

There is a significant number of measurement KPIs identified in Figure , and contracting against each individual one is not considered the most effective approach.

The Prime Contractor has reviewed the numerous measurable parameters and identified Failure Arisings, Turn Around Time and Utilisation as the three that can be mathematically combined to indicate performance of the support solution.

The chosen parameters are influenced by all of the identified Measurement KPIs illustrated in Figure and can therefore legitimately be used as a Measure of Performance Indicator (MPI).

The following formula has been applied to provide an MPI that demonstrates effectively the key measurable and can be used as the basis for payment against performance:

10000 x (Utilisation/(TAT x Arisings))

Note 1: Arisings does not include Attrition or Accident, Misuse and Negligence Damage

Note 2: The 10000 multiplier is used purely to make the resulting MPI value easier to read

The results of the R&M modelling have been used to set the initial values for arisings (the annual quantity of failures based upon the utilisation) at IOC. Utilisation is based upon the figures provided by the Customer and detailed in the BFM and Utilisation paper [Doc Ref: XXXXX].

Inserting the analysis values into the above formula provides the initial MPI values as demonstrated in Table 1.

Unit	Year 1	Year 2	Year 3
Arisings (Annual)	1429	2254	841
Utilisation Hours (Annual)	2100	3300	1100
TAT (hours)	420	420	420
Initial MPI Value	**34.99**	**34.86**	**31.14**

Table 1: MPI Value

The following table demonstrates the change in the MPI value when the input values change.

Unit	Example 1	Example 2	Example 3	Example 4	Example 5
Arisings (Annual)	1429	1600	1429	1429	1429
Utilisation Hours (Annual)	2100	2100	2100	1900	2500
TAT (hours)	420	420	520	420	420
MPI Value	**34.99**	**31.25**	**28.26**	**31.66**	**41.65**

Table 2: MPI Variation

6.7 KPI Interdependencies

The following matrix demonstrates the relationship between the KPIs identified previously in Figure . The matrix is read by taking the column titles as the primary KPI. By reading down each column any KPI that effects or contributes to the Primary KPI is marked with an “Y”, if no effect is apparent the cell is marked with a “N”.

For example the Table demonstrates that Stock-out is affected by Arisings.

	PRIMARY											
	Arising	MTTR	Transit Time	MALD	Organis-ation	Stock-out	TAT	Train-ing	Docum-entation	AM&ND	Utilisa-tion	NFF
Arising		Y	N	Y	Y	Y	Y	Y	N	N	N	Y
MTTR	N		N	N	N	N	N	Y	Y	N	Y	N
Transit Time	N	N		Y	Y	Y	N	N	N	N	Y	N
MALD	N	N	N		N	N	N	N	N	N	Y	N
Organisation	N	N	Y	Y		Y	Y	N	Y	Y	Y	N
Stock Out	N	Y	N	Y	N		N	N	N	N	Y	Y
TAT	N	Y	N	Y	Y	Y		N	N	Y	Y	N
Training	N	Y	N	N	N	Y	N		Y	N	Y	Y
Documentation	N	Y	N	N	N	N	N	Y		N	Y	Y
AM&ND	N	Y	N	Y	Y	Y	N	N	N		Y	N
Utilisation	Y	Y	N	Y	N	Y	Y	N	N	Y		Y
NFF	N	N	N	N	N	Y	Y	N	N	N	Y	

Table 3: KPI Interdependencies

6.8 Internal Indicators

The following paragraphs provide an overview of each of the KPIs identified in Figure and define the following, where applicable, for each KPI:

Title:	**Description:**
Title/Name of parameter	Brief definition of parameter
Effect On:	Influence of this KPI on others
Affected by:	KPIs that influence this KPI
Unit(s) of Measure:	e.g. Hours, Days, Costs, Quantity
Data Source:	Where is data derived
Initial Value Derived from:	Prediction, Field data
Updated Value derived from:	Field data, ESM, MPLDS
Measurement Level:	System, Equipment, Implied
Reporting Level:	System, Major Asset, Equipment
Initial (IOC) Value(s):	Value set for this KPI at IOC based on information available
Target (FOC) Value(s):	Value expected for this KPI at FOC

Table 4: KPI Descriptor

6.8.1 Arisings

The monitoring and asset management capability of the M&PS enables the utilisation and maintenance history of the equipment to be recorded in detail. This provides the base data from which the reliability of the System X equipment can be determined.

There is a significant amount of equipment within the System X solution and it is not intended to report against each individual equipment type although MPLDS will store this data and it will be reviewed on a regular basis. The MTBF will be monitored against System X major assets.

This monitoring of major asset MTBF will lead, over time, to a view on Operational Availability which is influenced by deployment layout and functionality used during each individual scenario.

Arisings is directly linked to equipment MTBF, and is the total quantity of failures that are identified at the system level.

For IOC the number of arisings has been allocated based on the extensive analysis undertaken during the Assessment Phase. The FOC milestone is the target to review the number of arisings based upon real utilisation data from the fielded System X equipment.

The IOC MTBF figures are set from the analysis performed in the Assessment Phase and will be used for the period to FOC. At FOC the utilisation and number of failures from equipment usage will be known, and a far more accurate view of individual equipment reliability, derived from collected and collated field data, can be taken. This field data will be used to update the established benchmark and to identify any trends or abnormalities.

For the purposes of measurement all arisings will be recorded and evaluated including those that are subsequently deemed as attrition, damage or NFF.

Table 5 identifies the links and values associated with the Arisings KPI.

Title	Description
Arisings	Total number of system failures detected
Effect On	See Table 3
Affected by	See Table 3
Unit(s) of Measure	Hours
Data Source	Management System, ATA
Initial Value Derived from:	MTBF Predictions/R&M Report
Updated Value derived from:	Operating Hours + Failure arisings
Measurement Level	Equipment
Reporting Level	System + Major Asset
Initial (IOC) Value(s): Average	1100
Target (FOC) Value(s): Average	1000

Table 5: Arisings

6.8.2 Turn Around Time (TAT)

The Support Solution is based upon the collection from and delivery of all spares to a single point within the UK. During war fighting from this point the responsibility for the movement of items forward into the deployed area and back from the deployed area rests with the military supply chain. For Peacetime Support the policy adopted by the Prime Contractor is to provide the transportation from the point of repair to the forward location and vice versa. The Supply Chain philosophy is detailed in the ISSP - Support Solution [Doc Ref: XXXXXX].

The Turn Around Time (TAT) is a major contributor to support cost and system availability and as such is a key performance indicator. Table 6 identifies the values for this KPI based upon the support concept detailed in the ISSP - Support Solution [Doc Ref: XXXXXX].

The TAT is an integral part of providing a minimum cost, support solution, as it is an input into the calculation that determines the level of spares required to support the mission equipment. Table 6 identifies the TAT parameters that will be used and measured as a part of the support contract.

Table 5 identifies the links and values associated with the TAT KPI.

Title	Description
Turn Around Time:	Prime Contractor Repair/Replacement time
Effect On:	See Table 3
Affected by:	See Table 3
Unit(s) of Measure:	Days/Hours
Data Source:	Management System
Initial Value Derived from:	Prime requirements/Supplier responses/SLAs
Updated Value derived from:	Analysis of data. Input from suppliers
Measurement Level:	Prime Contractor
Reporting Level:	System
Initial (IOC) Value:	30 days
Target (FOC) Value:	25 days

Table 6: Turn Around Time

6.8.3 Utilisation

Equipment utilisation contributes to both the operating and support cost and will be accurately tracked in order to determine performance characteristics for each type of installed equipment. The support contract will be based upon agreed utilisation which, for this response, is taken from the BFM and Utilisation paper [Doc Ref: XXXXXX]. Utilisation contributes to the number of arisings that will occur, based on the equipment MTBF, and is a major contributing factor to the Support Life Cycle Cost (SLCC).

System X is designed and configured to make best use of all the hardware and software utilisation tracking facilities available within the equipment. As the support solution has to cope with the flexibility of the mission system, including multiple

deployments and partial deployments, utilisation information down to repairable item level is required. Where it has been deemed cost prohibitive to add “hours run” recording devices, hardware and/or software to particular items of equipment then information will be gathered from the next highest level of assembly. The utilisation figures used within this document are those defined in the BFM and Utilisation Report [Doc Ref: XXXXXX].

Table 5 identifies the links and values associated with the Utilisation KPI.

Title	Description
Utilisation:	System hours run
Effect On:	See Table 3
Affected by:	See Table 3
Unit(s) of Measure:	Hours
Data Source:	MPLDS, ESM, ATA
Initial Value Derived from:	BFM and Utilisation paper
Updated Value derived from:	Prime Contractor management systems, ESM data
Measurement Level:	System
Reporting Level:	Organisation
Initial minimum Value: (Annual)	1000 hrs
Initial maximum Value (Annual):	3314 hrs

Table 6: Utilisation

6.8.4 Stock Out

System X will be delivered at IOC with a complement of support assets and spares, the quantity of which is based on initial analysis of MTBF and utilisation, transit time and TAT.

Based upon the supplied BFM and Utilisation information and fully appreciating the Force Readiness cycle the Prime Contractor has selected a range and scale of spares together with their location. The location of spares is based upon the scenario modelling undertaken during the Assessment Phase and the subsequent Support Solution deployment that utilises spares holding locations dispersed throughout the deployment area.

Spares consumption rates, repair and logistic delay times together with transit time for repair teams have all been taken into account to determine the initial spares holdings and locations. The selection is based upon meeting a high availability whilst keeping the level of deployed (and hence purchased) spares to a minimum. Table 7 details the target values for stock-out.

Table 7 identifies the links and values associated with the Stock Out KPI.

Title:	Description:
Stock out	Unavailability of Spares
Effect On	See Table 3
Affected by	See Table 3
Unit(s) of Measure	Percentage (Stock out risk)
Data Source	Management System, ESM database, ATA
Initial Value Derived from:	Supplier responses/SLAs
Updated Value derived from:	Analysis of data. Input from suppliers, ESM provided data
Measurement Level	Prime Contractor
Reporting Level	Management
Initial (IOC) Stock-out Value	98%
Target (FOC) Stock-out Value	99%

Table 7: Stock Out

6.8.5 Documentation Updates

Review, update, deliver are the primary requirements of the Technical Documentation programme. It has been decided to include the update response time as a KPI as the link between training, maintenance and technical publications is very close within the fully integrated System X solution.

The production of the training material and electronic technical documentation is a core part of the integrated information approach that that has been adopted by the Prime Contractor for the delivery of information. The Logistics Demonstration will be the culmination of the progressive assurance of all technical documentation that will be required to support the System X solution including training material. When changes are required it is important that updates are correctly managed from the configuration control and progress management viewpoint. There will be a priority change procedure that ensures any urgent changes can be implemented, agreed and deployed within the minimum time.

The Shared Data Environment (SDE) will play an important part in the process of timely documentation updates. Reviews and approvals can be undertaken on-line and changes implemented immediately approval is given. The training and technical documentation that is employed in the field is provided on removable media which can be rapidly deployed to implement updates.

Table 8 identifies the links and values associated with the technical documentation Response Time KPI.

Title:	Description:
Technical Documentation	Update response time
Effect On	See Table 3
Affected by	See Table 3
Unit(s) of Measure	Days/Hours
Data Source	Internal management systems
Initial Value Derived from:	Transition to IOC
Updated Value derived from:	Analysis of data from User and internal management systems
Measurement Level	Prime Contractor
Reporting Level	Organisation
Initial (IOC) Value	TBA
Target (FOC) Value	TBA

Table 8: Technical Documents

6.8.6 Mean Time To Repair

Comprehensive preventive and corrective maintenance procedures will be detailed early in the D&M Phase and will be focused on minimising system downtime. The R&M Plan, [Doc Ref: XXXXXX], identifies the maintainability programme activities that will take place during the D&M Phase and the continuing tasks that will transition into the In-service Phase.

The Mean Time To Repair has been defined within the Customer documentation as XX minutes and applies across all elements of the system.

In conjunction with the MALD and preventive maintenance actions the MTTR is a key contributor to system down time. The MPLDS monitors the system and equipment performance and provides indications of out of tolerance conditions. These could be temporary problems or detected failures that will require maintenance action. The MTTR will be derived from the data captured by the MPLDS which will log the maintainer actions and store details of the system status including fault rectification.

Table 9 identifies the links and values associated with the MTTR KPI.

Title	Description
MTTR	Mean Time To Repair
Effect On:	See Table 3
Affected by:	See Table 3
Unit of Measure	Hours/Minutes
Data Source	Management System
Initial Value Derived from:	Initial Maintainability Analysis
Updates derived from:	MTA, Field experience
Measurement Level	System
Reporting Level	Organisation
Initial (IOC) Value	30 minutes
Target (FOC) Value	25 minutes

Table 9: Mean Time To Repair

6.8.7 No Fault Found

The issue of No Fault Found (NFF) impinges on both cost of support and system availability. NFF can be the result of insufficient BIT/BITE coverage, training, technical publications, individuals or non repeatable errors.

The comprehensive low level monitoring and BIT/BITE capabilities resident within the system enables detailed and constant monitoring of all System X assets. A comprehensive and integrated training and technical publications solution and the BIT/BITE capability combine to minimise the possibility of NFF occurrences.

Analysis of the system BIT/BITE Testability Analysis Report [Doc Ref: XXXXXX] provides confidence in the level of fault detection and isolation that can be achieved with the deployed equipment. Indirectly this analysis provides an indication of the likelihood of NFF occurring based upon the functions that are not covered by the comprehensive BIT/BITE and/or where a level of ambiguity exists in fault isolation.

Table 10 identifies the links and values associated with the NFF KPI.

Title:	Description:
No Fault Found	System identified failures that are not confirmed at the equipment level
Effect On:	See Table 3
Affected by:	See Table 3
Unit(s) of Measure:	Quantity
Data Source:	Prime Contractor internal management systems, ESM database, ATA
Initial Value Derived from:	Analysis
Updated Value derived from:	Field Data
Measurement Level:	Equipment
Reporting Level:	Organisation
Initial (IOC) Value(s): Electronic Initial (IOC) Value(s): Mechanical	30% 20%
Target (FOC) Value(s): Electronic Target (FOC) Value(s): Mechanical	20% 15%

Table 10: No Fault Found

6.8.8 Transit Time

Transit time is an integral part of TAT and has been separated for two reasons. The first is that if commercial carriers are used it is important to monitor their performance as any delays could lead to unacceptable service delivery by the Prime Contractor. Secondly when the military supply chain is used to move System X assets within the deployment area the transit time will affect such parameters as stock out and availability.

The MPLDS has the capability to monitor the status of System X assets and the asset tracking application (ATA) supports the logistics aspects of the system. The ATA identifies when assets are removed from the system and tracks their progress through the repair/disposal loop. This enables the transit time to be accurately tracked and identify any particular problems. The Equipment Support Manager (ESM) has access to the ATA and can therefore track assets throughout any System X deployment and establish transit times for comparison.

Table 11 identifies the links and values associated with the Transit Time KPI.

Title:	Description:
Transit Time	Time taken to transport items from point of failure to point of repair
Effect On:	See Table 3
Affected by:	See Table 3
Unit(s) of Measure:	Hours
Data Source:	ATA, ESM, Carrier, Prime Contractor management systems
Initial Value Derived from:	Analysis
Updated Value derived from:	Field Data
Measurement Level:	Individual Item
Reporting Level:	Organisation
Initial (IOC) Value(s):	TBA
Target (FOC) Value(s):	TBA

Table 11: Transit Time

6.8.9 Training

However functionally capable the System X is, the full potential will only be realised if the personnel operating and maintaining the equipment are comprehensively trained.

The Training Needs Analysis [Doc Ref: XXXXXX] and Training Plan [Doc Ref: XXXXXX] detail the recommended training solution that makes use of a combination of actual mission equipment and Computer Based Training based on a proven in-service training solution.

From a measurement viewpoint training is a “soft issue” in that it is difficult to define and apply rigid values to as indicators of performance. However the importance of training has been previously stated and it is possible to monitor based upon the frequency of changes required that are not instigated through a change in system functionality or capability.

Table 12 identifies the links and values associated with the Training KPI.

Title:	Description:
Training	Delivery of suitable training
Effect On:	See Table 3
Affected by:	See Table 3
Unit(s) of Measure:	Frequency of updates required
Data Source:	Training Management
Initial Value Derived from:	Pilot Training Courses
Updated Value derived from:	Initial Training Courses
Measurement Level:	Trained Personnel
Reporting Level:	Organisation
Initial (IOC) Value(s):	TBA
Target (FOC) Value(s):	TBA

Table 12: Training

6.8.10 Organisation

The Support Solution programme is dependent upon a well managed service and a close working relationship between the User community and the Prime Contractor. The organisational structure that supports the support solution is detailed in the ISSP – Support Solution [Doc Ref: XXXXXX] which describes the facilities and skills that will be resident in the UK and mainland Europe.

In the same way as training, measurement of organisational efficiency is not just a case of setting benchmark values and comparing against them. However, insufficient resource, insufficient communication and late transfer of information between the interested parties has the potential to affect the quality of service delivery.

The performance of both customer and contractor organisations will be reviewed on a regular basis through regular project and progress reviews where any necessary actions can be identified and allocated.

Table 13 identifies the links and values associated with the Organisation KPI.

Title:	Description:
Organisation	Management Structure
Effect On:	See Table 3
Affected by:	See Table 3
Unit(s) of Measure:	Efficiency of programme management
Data Source:	Assessment of programme performance
Initial Value Derived from:	Transition to IOC
Updated Value derived from:	IOC to FOC
Measurement Level:	N/A
Reporting Level:	Organisation
Initial (IOC) Value(s):	N/A
Target (FOC) Value(s):	N/A

Table 13: Organisation

6.8.11 Mean Administrative Logistics Delay

The Mean Administrative Logistic Delay (MALD) is a key contributor to system downtime and is specified as X hours in the Customer supplied information. It must be understood that this is a mean value and as such does not equate to the MALD being a maximum of X hours.

The Deployment Scenario – [Doc Ref: XXXXXX] has been used as the baseline to ensure that the X hour MALD can be met in a “real” deployment situation and the ISSP - Support Solution [Doc Ref: XXXXXX] reflects the implementation of the support solution.

MALD will be logged by the MPLDS based upon a maintenance action request being raised and the maintenance team logging their arrival at the point of repair.

Table 14 identifies the links and values associated with the MALD KPI.

Title:	Description:
Mean Administrative Logistics Delay	Time taken for the appropriate skills and materials to reach the point of failure
Effect On:	See Table 3
Affected by:	See Table 3
Unit(s) of Measure:	Hours
Data Source:	ATA/MPLDS
Initial Value Derived from:	Analysis and scenario modelling
Updated Value derived from:	Field data
Measurement Level:	System
Reporting Level:	Organisation
Initial (IOC) Value(s):	X hours
Target (FOC) Value(s):	Y hours

Table 14: Mean Administrative Logistic Delay

6.8.12 Accident, Misuse, and Negligence Damage

The Master Data and Assumptions List (MDAL) specifies the percentages to be used for Accident, Misuse and Negligence Damage.

Table 15 identifies the links and values associated with the AM&ND KPI.

Title:	Description:
Accident, Misuse and Negligence Damage	Failures that occur through improper use of the equipment
Effect On:	See Table 3
Affected by:	See Table 3
Unit(s) of Measure:	Quantity
Data Source:	ATA, ESM, sentencing committee
Initial Value Derived from:	MDAL
Updated Value derived from:	Field data
Measurement Level:	Equipment
Reporting Level:	Organisation
Initial (IOC) Value(s):	See MDAL
Target (FOC) Value(s):	TBA

Table 15: Accident, Misuse and Negligence Damage

7 BENCHMARKING

On delivery of the System X solution for IOC the performance benchmarks will be set based upon data analysis, historic data and available field data. This will set the reference points against which performance can be measured. The initial benchmark values upon which the support solution is based are detailed in Paragraph 6.8 of this document.

7.1 Updates

The support solution continuous improvement process is one of iterative measurement, analysis, recommendation and update. Throughout the in-service life of System X, Internal and External measurement criteria will be reviewed and if necessary the benchmark figures updated to more accurately reflect the system performance. This provides visibility of improvement.

Data collected during the initial support period will be used to re-evaluate the benchmarks set at IOC. Field data will be compared with predicted data and an assessment made on the benchmark values and any updates will be agreed with the Customer.