LEAFLET 5

CONTRACTING FOR AVAILABILITY

(From a Reliability and Maintainability Perspective)

CONTENT

1. INTRODUCTION

Contracting for Availability (CfA) is a commercial process which seeks to sustain a system or capability at an agreed level of readiness, over an extended period of time, by building a partnering arrangement between the MoD and Industry. The result of this process will be an *Availability Contract*, which should include incentives for both parties to improve efficiency and effectiveness over the life of the agreement. This is similar to a comprehensive Contractor Logistics Support (CLS) arrangement, which uses Availability as its principal metric. CfA can be applied to new capabilities and legacy systems in any environment, at various levels. Fundamentally it must address the Availability of *what, when* and *where.*

2. AIM

2.1 The aim of this guide is to alert Project Staff to a series of significant issues relating to Reliability & Maintenance[1] which should be considered during the Contacting for Availability process and addressed by Availability Contracts.

2.2 Availability (A) is not a simple concept, since it has several recognised definitions and can be interpreted in various ways. Def Stan 00-49 (IEC 60050-191) defines availability as follows:

> The availability (of an item) is the ability to be in a state to perform as required, under given conditions, at a given instant, or over a given time interval.
>
> Intrinsic/inherent availability is the value determined when maintenance and operational conditions are assumed to be ideal.

From these examples it will be seen that Availability is therefore concerned with the readiness of a system to be committed to a task, however this does not necessarily guarantee that the assignment will be completed (this is a function of Reliability). Availability is a flexible concept which can be applied to diverse situations such as systems on a ship, aircraft on a flight line, stores delivery or ammunition on the battlefield. The Availability of a system is determined by 3 crucial factors: Reliability (R), Maintainability (M) and Logistic Delay, which are mathematically linked. In simple terms:

> **Availability:** Enables a system to start a mission;
>
> **Reliability:** Enables a system to complete a mission;
>
> **Maintainability & Logistics**: Enable Availability to be restored.

2.3 Almost any level of Availability can be achieved if sufficient resources are committed to a task, although costs will rise exponentially beyond the optimum level. In general, the higher the Reliability of a system, the less critical Maintainability and Logistics become and the less costly it will be to sustain a given level of Availability.[2]

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1 Encompassing: Availability, Maintainability, Durability, Testability and Reliability Centred Maintenance.

2 Since high Reliability can be difficult and costly to achieve, there is normally a trade-off between Reliability, Maintainability & Logistics in Procurement, to optimise EP expenditure against specified

2.4 CfA is a deceptively simple concept which can be extremely difficult to deliver, given the complexities and uncertainties which surround the Service environments. The success of individual arrangements will stand or fall on the effectiveness of the resulting contract and the degree of co-operation between the MoD and Prime Contractor. CfA should be exploited as an opportunity to improve support to the User community and not be viewed as a *flag of convenience* for financial savings, manpower reductions or the abrogation of responsibilities. Finally, the successful implementation of CfA requires a wholesale change of attitude by all stakeholders, since it requires traditional support activities to be replaced by innovative processes based on need.

3. LIMITATIONS

Several Project Teams have been engaged in the CfA process over a number of years and each has employed a divergent approach. This guide draws on experience from the Land, Sea and especially Air environments and lists many issues which should be considered during CfA. However, it is not intended to provide a blue print and must be adapted to the needs of individual projects.[3] The major difficulties encountered by projects have include: uncertainty over the User's needs, poor knowledge of the system under consideration, complex contractual boundaries, manpower and time, affordability and the division of risk.[4]

4. COOPERATION

To facilitate incremental agreement based on common understanding of the issues involved, it is strongly recommended that the MoD and Prime Contractor work closely together, throughout the CfA process. In view of the complexity and longevity of negotiations, the MoD team should be supported by a dedicated and experienced Commercial Officer.

5. COST OF FAILURE

The principal aim of CfA is to deliver equipment that keeps on working in the hands of the User. Depending on circumstances and the nature of the agreement, this may be wholly or partly Industry's responsibility. Although Contractors[5] may be incentivised to meet commercial obligations, penalty payments for systems which fail at critical times offer little consolation for aborted missions or lost lives. CfA must therefore focus on achieving reliable performance rather than penalising deficiencies.

6. APPLICABILITY

6.1 CfA can be applied to most capabilities at a variety of levels, including:

a) Platform: Such as ships, aircraft, tanks or trucks.

b) System: Including Radars, IFF, power packs, armaments and simulators.

c) Sub System: Such as engines, gun sights, starter motors and radio harness.

Availability levels.

[3] Great caution should be exercised in copying other contracts.

[4] Encompassing: the identification, apportionment, management and mitigation of risk.

[5] It must be clearly understood that Industry is motivated by increasing profit and reducing commercial risk.

d) Equipment: Including small arms, mobile generators and radios.

e) Spares: Such as circuit boards, components and consumables.

f) Personnel: Including maintainers and specialists.

g) Services: Such as laundry, data analysis, servicing and transportation.

h) Facilities: Including dock yards, air stations and sleeping accommodation.

6.2 For the sake of simplicity, discussion within this guide will be focused at platform / system level, although there is considerable commonality in all categories.

ATTACHMENT G5/1

CfA ISSUES ASSOCATED WITH RELIABILITY & MAINTENANCE

1. INTRODUCTION

The following issues are directly or indirectly associated with Reliability & Maintenance and should be given serious consideration during the CfA process. Every issue should be adapted to the system under consideration and addressed in the Availability Contract.

1.1 Definitions

The first and most important issue to be considered is the definition of key words, starting with Availability and including Reliability, Maintainability and Logistic Delay. Many other terms such as faults, failures and fixes may need to be added to the list during the CfA process. Every term must be discussed and agreed with the Prime Contractor and enshrined in the Availability contract (see Def Stan 00-49 for guidance on R&M Terminology Used in Requirements).

1.2 Systems

The second most important issue is the nature of the system to be supported. This may be a single platform, a group of equipments, a fleet of vehicles or a set of assemblies. The extent of the system and any supporting material must be quantified and agreed with the Contractor. In addition, it would be desirable to predict any changes which are likely to occur over the period of the contract, especially if the number of systems increases or decreases as a result of restructuring within the MoD. Special attentions should be paid to the integration of legacy support contracts at sub system level.

1.3 Circumstance

The third most important issue is the circumstance under which Availability is to be delivered. At the highest level there are number of scenarios ranging from storage & training in Peacetime through Operations Other Than War (OOTW) to intensive combat in War. Depending on the scenario selected, the period over which Availability is required must be specified in the Availability contract.[6] This could result in a suite of different Availability requirements to match different scenarios. To cater for the unexpected, Contracts should provide a framework to negotiate additional requirements.

1.4 Point of Delivery

The fourth critical issue is where Availability is to be delivered. This would normally be at the interface between the Contactor and MoD and might range from the factory gate to the front line. It could be in the UK, overseas, on board ship or at an air head. However, the bigger the gap between the point of delivery and the point of consumption, the less relevant

[6] Availability may not be required 24 hours a day, 7 days a week, in all locations.

the contracted level of Availability will be to the User. Clearly, delivery into the front line on operations could be difficult and costly.

1.5 Measurement

To provide assurance that a Contractor is delivering an agreed level of Availability, it will be necessary to establish a robust measurement mechanism. Ideally, measurement should be undertaken at the boundary between Industry and the MoD, where it is evident that failure to meet agreed requirements can be unambiguously attributed to one party or the other. Measurement should be underpinned by a number of agreed metrics such as: spares supplied on time, range days, flying hours, days at sea, queries answered or assets repaired within time. Each metric may be supported by a number of data elements, such as part numbers, meter readings or repair times, which will need to be recorded by the Contactor or the User. This could be facilitated by a bespoke IT facility like ADGPS[7] or hosted on a generic system like JAMES or LITS. Whatever solution is selected, a joint mechanism must be established to manage security, the capture, transmission, assessment, storage and analysis of data, and subsequent dissemination of information. To ease the burden of capturing data from large fleets, it may be possible to use automated systems, telemetry or statistical methods (with the aid of a qualified Statistician).

1.6 Operating Context

If Availability is to be delivered directly to the User on training or operations, it is important to understand the function the system is required to perform and the environment in which it will operate. Systems or sub-systems will normally be required to perform a series of tasks over a given period of time. Frequently referred to as missions, they can vary from a few hours for an aircraft sortie, to a 24 hour battlefield day for an Army vehicle and many weeks at sea for a naval vessel. Environments will be determined by geography and the seasons of the year. All these factors should have been specified during the procurement process. However, consideration should be given to systems being used outside their specified envelopes, since this could undermine both Availability and Reliability.

1.7 Customer Requirements

The Principal Customer[8] should be included in the early stages of the CfA process, to clarify what the User wishes the arrangement to provide and agree any contribution they should make to the Availability contract. This might include data capture, incident reporting, return of carcasses, replenishment and servicing. They should also help define the Availability requirement and boundary conditions, since it is normally the User who will interface with the Contactor on a regular basis.

1.8 Boundaries

To ensure Availability contracts are effective, it is essential to define the interface between Industry and the MoD. In simple terms this is the window through which assets, services and information are passed between the Contractor and the User. Since any transaction which takes place over this boundary should be recorded, it is desirable to make it as simple as possible. The boundary, which is related to the *Point of Delivery,* may not be confined to

[7] Rapier - Automated Data Gathering & Processing System

[8] This should be an experienced representative from the Front Line Commands (Customer 2).

geography and might encompass: ownership of assets, the location of exchange points, constraints on use, exchange of information and overseas deployments. In addition, a mechanism should be established to review and adjust the boundary during the life of the agreement, especially if support is unexpectedly required on operations. A schematic diagram indicating high level boundaries for a typical military system is shown in Figure 1 at the end of this attachment.

1.9 Responsibilities

In order to make Availability contracts work effectively, it will be necessary for the MoD and Industry to co-operate at many levels. To ease and clarify this process it would be desirable to specify significant responsibilities on each side of the contractual boundary. The division of responsibilities will depend on the natures of the systems and the contract, but might encompass: the management of serviceable and unserviceable assets, data capture and response times.

1.10 Integration

The interface established between the MoD and Industry for an Availability contract should not exclude cross boundary co-operation. Consideration should be given to the need to preserve skills within the MoD, which may require Servicemen to work along side the Contractor in Depth maintenance facilities. Conversely, Contractors my need to deploy specialist staff in the Forward environment to advise the User or resolve complex problems. If Availability is to be assured on operations, consideration must be given to the use of Contractors on Deployed Operation (CONDO)[9] or Sponsored Reserves and specialist advice should be sought at the earliest opportunity. Availability contracts should include facilities for cross boundary activities, with arrangements of appropriate remuneration.

1.11 System Knowledge

Before an Availability contract is signed, it will be necessary to provide the Prime Contractor with Baseline information about the assets under consideration. Aside from how many systems there are, they may wish to know where they are, what state each one is in and their configuration. This may be extended to include any spares, line replaceable units, tools, test equipment, facilities and resources encompassed by the agreement. Additional information will almost certainly be required, if only as a benchmark, such as the levels of Availability, Reliability, Maintainability and Logistic Delays achieved by legacy systems.

1.12 Contract Length

The length of an Availability contract will have a profound effect on Industry's commitment to supporting a system. In essence, the longer the agreement, the more likely a Contractor will be to invest in improvements which protect profit margins are in the medium to long term. Given the difficulty of the CfA process, contracts in the 15 to 25 year range will be far more attractive than traditional 5 years arrangements. However, comprehensive exit strategies must be agreed with industry to allow early termination when necessary.

[9] See DEFCON 697.

1.13 Governance

Consideration must be given to the Governance of Availability contracts. Mechanisms should be established to monitor and control delivery, encompassing:

a) A joint MoD / Industry management committee.

b) An Assurance process based on measurement.

c) An incident sentencing process to consider arisings & attribute responsibility.

d) A process to authorise payments against milestones.

e) A process to: amend, renew, transfer or terminate the contract.

f) An arbitration process to resolve disputes.

1.14 Incentives

One of the tenets of CfA is the provision of incentives for Industry and the MoD to co-operate and improve Availability or drive down costs over the life of the agreement. Availability contracts should include a requirement to establish a continuous improvement programme against a rising set of hurdles, such as supply times or Reliability levels. Rewards should only be released against the demonstration of tangible achievements. Incentives might include:

a) Gain-share for success.[10]

b) Pain-share for failure.

c) Higher profit margins for Industry.

d) Additional services for the MoD.

e) Reduced manning or inventories.

f) Reduced through life costs.

g) Service Credits.[11]

1.15 Legislation

While Health & Safety is universally applicable to MoD contracts, other legislation may also apply to Availability based agreements. This is especially true of munitions, aircraft and marine vessels. Advice should be sought from the appropriate authorities at the earliest opportunity.

1.16 Preventative Maintenance

One area where significant savings could be made as part of a continuous improvement programme is Preventative Maintenance (PM). This should be achieved using Reliability

[10] 50:50 or asymmetric in favour of the leading party.
[11] Penalty payments.

Centred Maintenance (RCM), a powerful engineering tool developed to optimise maintenance effort against a given level of Availability. In essence, it exploits the intrinsic Maintainability of a system, to maximise its inherent Reliability and minimise the probability of failure in use. By including RCM in Availability contracts the premise for legacy PM activities will be challenged and servicing regimes could be reduced by as much as 60%, saving valuable manpower, resources and money.

1.17 Risk

In general, Industry will endeavour to minimise its exposure to risk or seek commensurate rewards for managing hazards that cannot be mitigated. Recent history would suggest it is impossible for the MoD to describe support requirements over 5 let alone 25 years. An all embracing contract with sufficient flexibility to cover every scenario from peacetime storage to high intensity operations would probably be unaffordable. It may therefore be desirable to establish a baseline contract to support steady state peacetime activities, with bounded options to sustain operations at various levels of intensity. Recent experience of CfA would suggest additional areas of risk which should be avoided:

a) Uncertainty over the User requirements.

b) Misunderstanding over terminology.

c) Poor communications.

d) Lack of accountability.

e) Poor data capture.

f) Changing requirements.

g) Optimistic time scales.

h) An assumption that MoD support arrangements will remain unchanged.

1.18 Quality Assurance

Quality could have a profound effect on Availability. Depending on the nature of a contract, this might include: work undertaken by users or maintainers, spares, consumables and information supplied to support the system, packaging and storage condition to protect assets and data exchanged between the MoD and Contractor. Consideration of Quality should extend beyond normal peacetime support to include training and operational deployments, where local supplies of consumables[12] may fall below accepted standards. As a result it is highly desirable to include a Quality Assurance mechanism in any Availability contract.

1.19 AR&M

In view of their close relationship, all Availability contracts should be underpinned by Reliability requirements. For legacy systems these should be well known,[13] although incentive schemes should encourage Contractors to gradually raise levels over the life of the

[12] Especially fuel and lubricants.

[13] It is therefore essential to quantify the level of Reliability achieved In-service.

contract. Likewise, Logistic and Maintainability targets should be set to increase efficiency and save money. Progress against AR&M targets must be measured and assured.

1.20 Response Times

Although highly desirable, the immediate Availability of all assets at all times would be difficult and costly to achieve. A number of different response times might therefore be established within an Availability Contract, including:

a) Notice to achieve higher levels of Availability.

b) Periods within which any shortfall should be rectified.

c) Turn around times.

d) Repair times.

1.21 Redundancy

A well established method to achieving high Availability for critical systems is *redundancy.* In essence, several assets are allocated to a specific role to minimise the risk of failure, which is why ships and passenger aircraft have more than one engine. A similar effect could be achieved with a fleet of simpler systems, by allocating say 30 trucks to a mission which only requires 24, providing 6 spare vehicles to replace casualties. The process must be carefully managed to avoid excess and standby assets come at a cost.

1.22 Obsolescence

Obsolete systems, sub systems, components and software could become a major issue over the life of an Availability contract. However, it is seldom necessary to undertake modification action to manage outdated hardware. Obsolescence should be an important part of CfA process with the Contractor assuming responsibility for the intelligent management of Post Design Services (PDS). Various techniques could be used to overcome obsolescence without resorting to costly redesign and modification programmes, including: doing nothing,[14] reclamation, lifetime buy of spares, finding an equivalent and changing use patterns or procedures.

2. OTHER FACTORSAFFECTING CfA

Numerous other issues, not directly connected with Reliability or Maintenance but which frequently influence them will also need to be considered during the CfA process. A list of significant subjects is presented below as an aide memoir. Project staff are strongly advised to seek specialist advice when considering any of these subjects:

a) Health & Safety.

b) Contractual Terms & Conditions.

c) Value for Money.

[14] If an item is not critical, seldom fails or there are sufficient spares in stock.

d) Political considerations, including the Defence Industry Strategy (DSI).

e) Upgrades, Mid Life Improvement and Urgent Operational Requirements.

f) Managing customers' expectations.

g) Equipment Care.

h) Human Error.

i) Disposal.

3. STAKEHOLDERS

Numerous organisations within and outside the MoD have an interest in the CfA process, including:

a) Supportability Engineering (ILS).

b) Quality Assurance (QA).

c) Partnering Support Group (PSG)

d) Price Forecasting Group (PFG).

e) Defence Communication Support Agency (DCSA)[15]

f) Defence Logistics Transformation Programme (DLTP).

g) Front Line Commands (FLCs).

h) Training Organisations.

[15] For IT bearer systems including: DII and JAMES etc

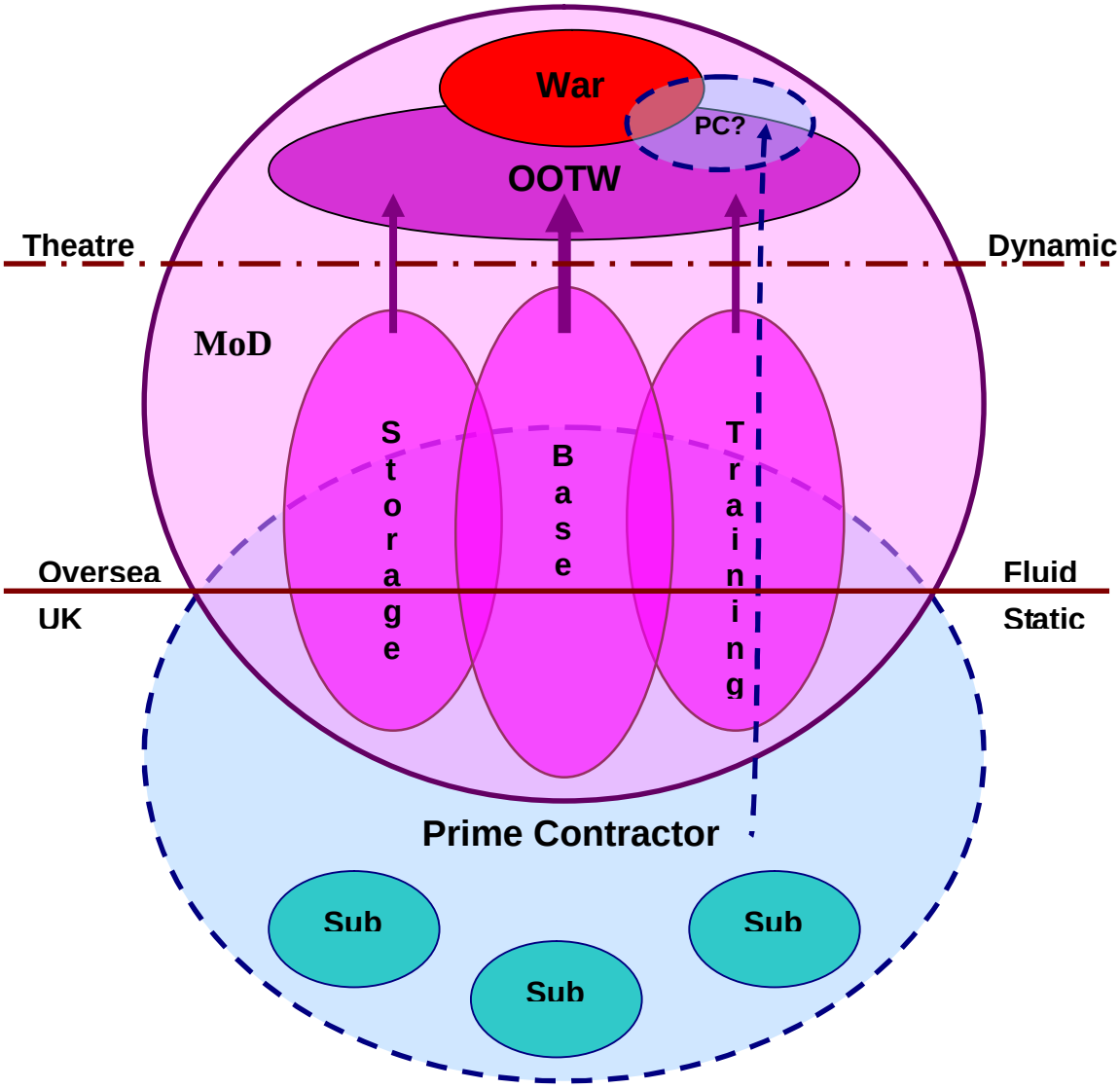

Figure 1 – Contracting for Availability Boundaries

ATTACHMENT G5/2

UNDERSTANDING SYSTEM AVAILABILITY

1. INTRODUCTION

In Attachment G5/1 the issues associated with CfA are discussed in some detail however many of these issues will not be addressed appropriately if the required system to be acquired and in particular its functionality and usage is not fully appreciated.

The first of the three objectives of progressive assurance and the R&M Case (Def Stan 00-42, Part 3 refers) is that:

> *"The R&M requirements of the Purchaser shall be determined and demonstrated to be understood by the Purchaser and Contractor;"*

Too frequently this is not the case and the Purchasers do not understand their own requirements and hence would have considerable difficulty conveying them to their respective Contractors.

2. Maritime Availability

In the following example a maritime system has been chosen to demonstrate the scope of consideration required particularly when acquiring a complex system such as a warship.

There are at least 3 levels of availability in the maritime environment:

- Fleet – percentage of ships available to task;
- Ship – is a specific ship available to task;
- System - is a specific system functioning.

At the Fleet level the main drivers are the:

- Amount of Inspection/maintenance required outside of fleet time;
- The frequency of these activities;
- The available support capacity and it's efficiency;
- The amount of update/upgrade activity.

At the ship level (within fleet time) the main drivers are:

- The reliability of critical systems (do the systems work);
- The support chain (can we fix problems in a timely fashion);
- The amount of Fleet time maintenance.

At the system level the main drivers are:

- The Reliability of the system;
- The amount of maintenance required;
- The effectiveness of the support solution;
- The availability of skilled people to undertake the maintenance.

Considering each driver inevitably raise more questions than they answer however without such consideration it will not be possible to determine the levels of availability required to address any capability shortfall.