TECHNICAL AND COMPLIANCE COMMITTEE

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PROGRESS WITH IMPLEMENTATION OF THE COMMISSION VMS

WCPFC/TCC2/2006/10
07 September 2006

Paper prepared by the Secretariat[1]

Introduction

1. One of the Commission's primary tasks is to establish and maintain a satellite-based vessel monitoring system (VMS) for fishing vessels authorized to fish on the high seas in the Convention Area beyond national jurisdiction of the CCM in whose flag the vessel is flying. At its second regular session in December 2005, the Commission (Comm2) adopted a recommendation by the first regular session of the Technical and Compliance Committee (TCC1) that the agreed functions of the Commission's VMS program are to:

a. track the position and speed of all fishing vessels that fish for highly migratory fish stocks covered by the Convention on the high seas in the Convention Area and any waters under national jurisdiction as requested by Members as per Article 24(8);

b. support of the MCS functions of the Commission (e.g. transshipment monitoring, observers); and

c. facilitation of the monitoring and enforcement of conservation/management measures (e.g. closed areas).

Process for establishing the Commission VMS

2, In accordance with the agreed process for establishing the Commission VMS described in the TCC work program endorsed by Comm2, during the inter-sessional period the Commission Secretariat addressed the following three elements of the work program:

a. cost assessment and feasibility of the short-listed options for the Commission VMS;

b. draft certification requirements for Automatic Location Communicators (ALC); and

c. draft Commission rules and procedures for the release and use of VMS data.

Cost assessment and feasibility of the short-listed options for the Commission VMS

[1] Attachment 1 was prepared by Marine Resources Assessment Group (MRAG) Ltd., 18 Queen Street, London, United Kingdom.

3. Comm2 endorsed a recommendation by TCC1 that the Commission Secretariat undertake further work during 2006 in respect of the Commission VMS, including a cost assessment and feasibility study of two options identified as offering the best potential to meet the Commission's needs. The Commission Secretariat chose to approach this part of the work program by means of a consultancy, the objective of which was to provide advice on the estimated cost and feasibility of two options for the implementation of the Commission VMS, namely:

a. two VMS with the FFA VMS[2] forwarding relevant high seas data to the Commission VMS; and

b. two separate VMS (Commission VMS for the high seas in the Convention Area and the FFA VMS for FFA member EEZs).

4. WCPFC/TCC1/13 Rev.1 dated 22 November 2005[3] presents details of option 'a' as 'Option 3' and details of option 'b' as 'Option 5'.

5. Following a competitive request for expressions of interest in conducting the Commission VMS cost assessment and feasibility study, in June 2006 the Commission Secretariat contracted MRAG Ltd., London, United Kingdom to undertake this work. As part of the study, MRAG Ltd. sought information from CCM and fishing vessel operators by means of a questionnaire. The final consultancy report prepared by MRAG Ltd. is appended at **Attachment 1**.

Draft Certification Requirements for Automatic Location Communicators

6. TCC1 received a draft specification for the use of Automatic Location Communicators (ALC) by vessels operating under the Commission VMS. It was agreed that CCM would review the draft specification for further discussion at TCC2.

7. Comm2 adopted a recommendation by TCC1 that approval of ALC standards that do not include a polling capability be contingent on the following conditions:

a. that the reporting rate be set at a frequency sufficient to ensure that the effectiveness of the program as a monitoring and enforcement tool was not compromised; and

b. that vessels equipped with such units have on board and operational at all times an alternative method of two-way communication between the vessel and the VMS system operators.

8. In accordance with the agreed process for establishing the Commission VMS described in the TCC work program endorsed by Comm2, the Commission Secretariat received written comments on the draft specification from France, French Polynesia, Japan, New Caledonia, Niue and Tonga. Because of the diversity in views expressed in these written comments the Commission Secretariat was unable to develop a revised draft specification for discussion at TCC2 and has therefore re-presented the original draft specification for the Committee's consideration (**Attachment 2**).

Draft Commission Rules and Procedures for the Release and Use of VMS Data

9. TCC1 received a draft set of Commission Rules and Procedures for the Release and Use of VMS Data. In accordance with the agreed process for establishing the Commission VMS

[2] The secretariat of a Regional Fisheries Body, the Pacific Islands Forum Fisheries Agency (FFA) manages and administers the FFA VMS on behalf of its 17 members, covering their respective EEZs in the western and central Pacific Ocean (WCPO) region.

[3] WCPFC/TCC1/13 Rev.1 'Review of VMS Standards and Specifications and a Summary of Options for the Establishment of a VMS by the Commission under Article 24 of the Convention.'

described in the TCC work program endorsed by Comm2, the Commission Secretariat arranged for discussion of this issue during the Ad Hoc Task Group [Data] meeting held at Manila, Philippines from 31 July to 04 August 2006. The summary record of this meeting forms an attachment to WCPFC/TCC2/2006/18.

Conclusion

In the inter-sessional period between TCC1 and TCC2, the Commission Secretariat has implemented the agreed process for establishing the Commission VMS. CCM are invited to consider the material prepared by the Commission Secretariat addressing the three elements of the work program and make recommendations to the Commission on the Commission VMS in regard to:

a. the preferred option for its implementation;

b. a cost-recovery mechanism;

c. final ALC certification requirements; and

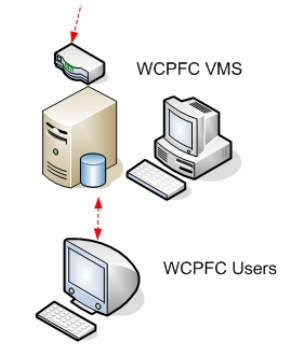
d. rules and procedures for the release and use of Commission VMS data.

Attachment 1

Western and Central Pacific Fisheries Commission

Feasibility Study and Assessment of Operational Costs of Options for the Commission Vessel Monitoring System

FINAL REPORT



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List of Acronyms

AHTG	Ad Hoc Task Group
ALC	Automatic Location Communicator
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCM	Commission Members, Cooperating Non-Members & Participating Territories
CDS	Catch Documentation Scheme
CROP	Council of Regional Organisations in the Pacific
CSA	Commission Statistical Area
DCD	*Dissostichus* catch document
EC	European Commission
EEZ	Exclusive Economic Zone
EU	European Union
FFA	Forum Fisheries Agency
FMC	Fisheries Monitoring Centre
FSM	Federated States of Micronesia
FSP	Forwarding Service Provider
FTE	Full Time Equivalent
GPS	Global Positioning System
GRT	Gross Registered Tonnage
IDD	International Direct Dial
IRCS	International Telecommunication Radio Call Sign
ITU	International Telecommunication Union
LES	Land Earth Station
LOA	Length Overall
MCS	Monitoring, Control & Surveillance
NAF	North Atlantic Format
NAFO	North Atlantic Fisheries Organisation
NEAFC	North-East Atlantic Fisheries Commission
ODBC	Open Database Connectivity
RFMO	Regional Fisheries Management Organisation
SCSI	Small Computer System Interface
SWOT	Strengths, Weaknesses, Opportunities and Threats
TCC	Technical and Compliance Committee
UPS	Uninterruptible Power Supply
VMS	Vessel Monitoring System
VOIP	Voice Over Internet Protocol
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean
WIN	WCPFC Identification Number

Executive Summary

This paper examines the feasibility of two options for the Commission Vessel Monitoring System (VMS): Options A and B, as presented in WCPFC/TCC1/13 Rev. 1 "Review of VMS Standards and Specifications and a Summary of Options for the Establishment of a VMS by The Commission Under Article 24 Of The Convention".

The environment under which the Commission VMS must operate is outlined in Section 2, providing a framework within which each of the options can be evaluated. In addition, examples of VMSs of other Regional Fisheries Management Organisations (RFMOs) are described to consider any lessons learned of value to the development of the Commission VMS.

The Technical specifications of the two options are set out in detail in Section 3. In summary:

- Under Option A there are two vessel monitoring systems: the existing system based at the Secretariat of the Forum Fisheries Agency (FFA Secretariat) and a new one based at the Commission Secretariat. VMS data will be transmitted to the FFA VMS by vessels operating in the EEZs of FFA Members (as they currently do) and also by vessels of CCMs[4] operating on the high seas in the Convention Area. VMS data for vessels on the high seas in the Convention Area would be forwarded automatically by the FFA VMS to the Commission VMS in as close to real-time as possible.

- Under Option B the Commission VMS would be an entirely separate standalone system. All CCM vessels operating on the high seas in the Convention Area would be required to report directly to this VMS, based at the Commission Secretariat, irrespective of any other obligations to transmit VMS data to other systems under other arrangements.

While these options have been viewed primarily as mutually exclusive, we note also that it may be possible to implement them both in a combined scenario – i.e. Option A for some vessels and Option B for others. A logical scenario, for example, would be for vessels that already report to the FFA VMS within FFA Member EEZs to continue to do so when operating on the high seas in the Convention Area (i.e. Option A), while vessels that have no requirement to report to the FFA VMS report directly to the Commission VMS (i.e. Option B). The VMS data sent to the FFA VMS by CCM vessels on the high seas in the Convention Area would be forwarded automatically to the Commission VMS in accordance with Option A. This would require the Commission to develop a VMS that can receive data both directly from a vessel's Automatic Location Communicator (ALC) and indirectly from another VMS. In Option A it is the FFA VMS that is considered as the primary receptor of the VMS data, but it could equally be another VMS operating within the Convention Area. This capability would provide flexibility for maximum potential coverage of the Convention Area in the future[5].

In Section 4, each of the options is evaluated against the operating environment, using a SWOT (Strengths, Weaknesses, Opportunities and Threats) Analysis. The implications for the Commission, FFA and the fishing vessels of the CCMs are outlined for each of the options. Results of the SWOT analysis and recommendations are provided in detail along with additional issues for discussion.

[4] Commission Members, Cooperating Non-Members and Participating Territories

[5] The Commission VMS shall operate on vessels fishing on the high seas in the Convention Area, as defined in Article 3 of the Convention. Article 24 paragraph 8 states that "*Each member of the Commission shall require its fishing vessels that fish for highly migratory fish stocks on the high seas in the Convention Area to use near real-time satellite position-fixing transmitters while in such areas. The standards, specifications and procedures for the use of such transmitters shall be established by the Commission, which shall operate a vessel monitoring system for all vessels that fish for highly migratory fish stocks on the high seas in the Convention Area.*" Wherever the term "Convention Area" is used in this paper in the context of the area of application of the VMS, it should be deemed to be referring to the high seas in the Convention Area, unless otherwise specified. Note, however, that there is no procedural reason why the Commission VMS should not operate within a CCM's EEZ, if the CCM so requests.

A separate cost analysis of each of the options is outlined in Section 0. The projected cost over four years for Option A is US$1,702,951 and for Option B is US$1,481,526. The projected cost of the combined scenario over four years is $1,627,967. In addition to the cost analysis for the implementation and on-going management of the VMS, a series of cost recovery options are also presented (Section 5.2).

1. Introduction

This paper examines the feasibility of two options for the Commission Vessel Monitoring System (VMS). Options A and B are as presented in WCPFC/TCC1/13 Rev. 1 "Review of VMS Standards and Specifications and a Summary of Options for the Establishment of a VMS by The Commission Under Article 24 Of The Convention" [6].

Under Option A there are two vessel monitoring systems: the existing system based at the Secretariat of the Forum Fisheries Agency (FFA Secretariat) and a new one based at the Commission Secretariat. VMS data will be transmitted to the FFA Secretariat by vessels operating in the EEZs of FFA Members (as they currently do) and also by vessels of CCMs operating on the high seas in the Convention Area[7]. VMS data for vessels on the high seas in the Convention Area will be forwarded by the FFA VMS to the Commission VMS in as close to real-time as possible.

Under Option B the Commission VMS would be an entirely separate standalone system. All CCM vessels operating on the high seas in the Convention Area would be required to report directly to this VMS, based at the Commission Secretariat, irrespective of their obligations to transmit VMS data to other systems under other arrangements.

While these options have been viewed primarily as mutually exclusive, we note also that it may be possible to implement them both in a combined scenario – i.e. Option A for some vessels and Option B for others. A logical scenario, for example, would be for vessels that already report to the FFA VMS within FFA Member EEZs to continue to do so when operating on the high seas in the Convention Area (i.e. Option A), while vessels that have no requirement to report to the FFA VMS report directly to the Commission VMS (i.e. Option B). The position reports sent to the FFA VMS by CCM vessels on the high seas would be forwarded automatically to the Commission VMS in accordance with Option A. This would require the Commission to develop a VMS that can receive data both directly from a vessel's Automatic Location Communicator (ALC) and indirectly from another VMS. In Option A it is the FFA VMS that is considered as the primary receptor of the VMS data, but it could equally be another VMS operating within the Convention Area. This capability would provide flexibility for maximum potential coverage of the Convention Area in the future.

The environment under which the Commission VMS must operate is outlined in Section 2 to provide a framework against which each of the options has been evaluated. In addition, comparisons have been made between the planned Commission VMS and the respective VMSs of other Regional Fisheries Management Organisations (RFMOs).

The Technical Specifications of each of the options is presented in detail in Section 3. Section 4 presents a detailed technical evaluation of the options, structured as a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis. A separate cost analysis of each of the options is outlined in Section 5.

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[6] Option A was presented as Option 3 and Option B was presented as Option 5 in WCPFC/TCC1/13 Rev. 1

[7] The Commission VMS shall operate on vessels fishing on the high seas in the Convention Area, as defined in Article 3 of the Convention. Article 24 paragraph 8 states that "*Each member of the Commission shall require its fishing vessels that fish for highly migratory fish stocks on the high seas in the Convention Area to use near real-time satellite position-fixing transmitters while in such areas. The standards, specifications and procedures for the use of such transmitters shall be established by the Commission, which shall operate a vessel monitoring system for all vessels that fish for highly migratory fish stocks on the high seas in the Convention Area.*" Wherever the term "Convention Area" is used in this paper in the context of the area of application of the VMS, it should be deemed to be referring to the high seas in the Convention Area. Note, however, that the Commission VMS may operate within a CCM's EEZ, if the CCM so requests.

2. Operating environment

Understanding the operating environment for the VMS is critical in the efficient design and implementation of VMS solution. The main characteristics of the operating environment are:

- the fleets that will be tracked by the Commission VMS;
- the area of application (and the interaction between the high seas in the Convention Area and neighbouring areas – i.e. EEZs); and
- the service level requirements for the VMS itself, i.e. what the Commission VMS will be required to do.

2.1 Description of fleets

The main fleets that are operating in the Convention Area are purse seiners, longline, pole and line, and troll (see summary in Figure 1). To get a breakdown of the fleets, three sources of information were used:

- WCPFC–SC2 GN WP1 Estimates of Annual Catches in the WCPFC Convention Area (Lawson and Williams, 2006)
- Data from vessel registries held by the Commission Secretariat
- Data on fleets received directly from member States

By catch the purse seiners are the most significant fleet with 71 per cent of the catch in 2005 however the longline is also economically significant as it targets higher value species and has the largest number of vessels. The pole and line vessels are generally domestic fleets and only Japan and the US have significant trolling fleets. A breakdown of how the fleets are arranged is given in Figure 1 and the number of vessels by CCM, length and gear categories is provided in Table 1.

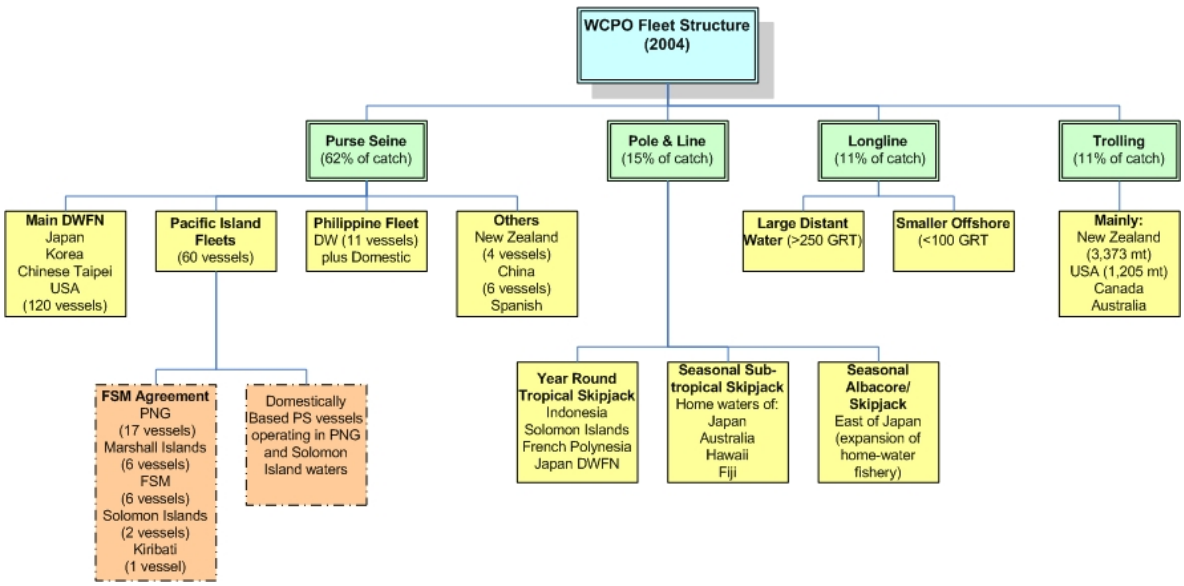

Figure 1 Breakdown of tuna fleets operating in the WCPFC Convention Area

Table 1 **Breakdown of the current fleet fishing in the region by CCM, gear and length (greater than or less than 24m) categories (Vessel Registry data).**

		Longline		Pole and line		Purse Seine		Trolling		Other	
Country	**Total**	**>=24**	**<24**	**>=24**	**<24**	**>=24**	**<24**	**>=24**	**<24**	**>=24**	**<24**
Australia	173	19	103	3	48						
Canada											
Chinese-Taipei	1929	655	1240			33	1				
Cook Islands	27	13	14								
EU France	23					23					
EU Portugal	11	6								5	
EU Spain	47	35	1			11					
EU United Kingdom	15	4								11	
FSM	12	6				6					
Fiji											
Indonesia											
Japan	1528	641	300			221	6		308	52	
Kiribati											
Korea	260	202				58					
Marshall Islands											
Nauru											
New Caledonia	26	7	19								
New Zealand	11	3	3			3	1	1			
Niue	0										
Palau											
Philippines	112	22				90					
Papua New Guinea	36	8	13			12					3
People's Republic of China	219	197	13			8				1	
Samoa											
Solomon Islands	4					4					
Tonga	12	4	8								
Tuvalu											
United States of America	566	30	118	1	11	16	7	14	217	23	129
Vanuatu	107	44	37			22	4				
Total	**5118**										
Greater than 24m	**2514**	**1896**		**4**		**507**		**15**		**92**	
Less than 24m	**2604**		**1869**		**59**		**19**		**525**		**132**

Available vessel registry data suggest that there are potentially over five thousand vessels that could be tracked by the Commission VMS at some point during a typical year. However we have broken down the composition of each of the fleets by size as this is representative of the endurance of the vessels as those vessels that are greater than 24m are more likely to be operating in the high seas areas, whereas those less than 24m are more likely to operate within coastal EEZs. After taking the vessel endurance into consideration nearly the whole of the purse seine fleet will be in the large vessel class, whilst the more numerous longliner fleet is almost equally divided between the two length categories (Table 1). Of the smaller vessel class, only those vessels that have flag State authorisation to fish on the high seas in the Convention Area will need to be tracked by the Commission VMS.

2.2 Convention Area

The area of concern to the Commission (the Convention Area) is shown as the light blue shaded area between the two red lines on Figure 2.

There are currently 43 individual areas of coastal state EEZs within the Convention Area, and seven areas of high seas enclosed by EEZs. This makes the Convention Area one of the most complex for Monitoring Control and Surveillance (MCS) management, and more specifically implementation of a VMS, in the world. Detailed procedures for information exchange will need to be implemented between the Commission Secretariat and coastal State authorities within the Convention Area. These procedures will include the movement of vessels from coastal State EEZs to the high seas within the Convention Area so that the Commission Secretariat can confirm which vessels should be reporting to the Commission VMS. Conversely, when a vessel leaves the high seas portion of the Convention Area and enters an EEZ, the Commission Secretariat will need to notify the appropriate coastal State authority.

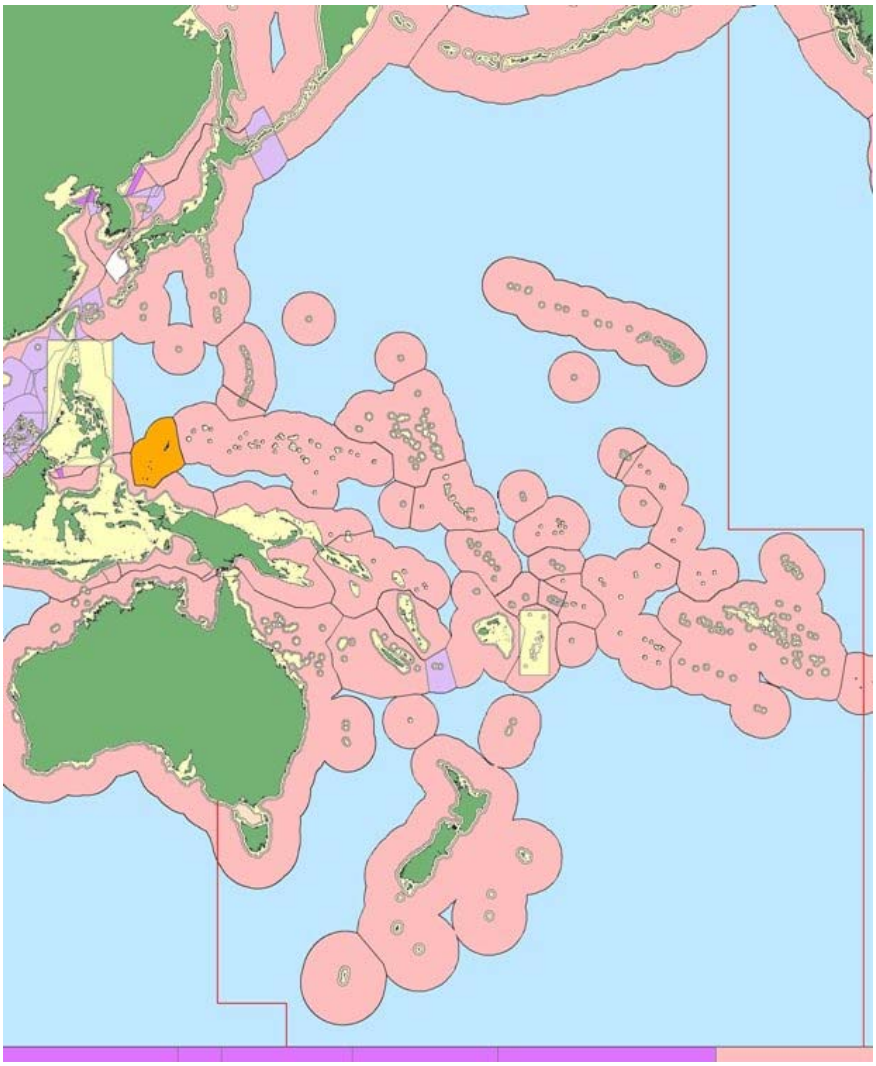

Figure 2 **Map of the Convention Area showing indicative EEZs (note, Palau has a Fishing Zone rather than an EEZ).**

2.3 Service level requirements

Certification requirements for ALCs were discussed at the first regular session of the Technical and Compliance Committee (TCC1) in December 2005. The resulting report[8] provides a draft of the requirements of electronic positioning and communications equipment for vessels required to utilise ALCs, so that authentic and secure positioning information can be obtained from fishing vessels. This document is still under development, but clearly it contains important information for the service level requirements of the Commission VMS. In this section we have abstracted some of the more important requirements from the draft and refer to the document where appropriate.

2.3.1 Satellite Service Provider Requirements

The Commission VMS will need to accept position reports from both the INMARSAT and Argos satellite networks. This requirement will ensure that large portions of current flag State fleets operating in the Convention Area do not need to install new ALCs before they can be tracked by the Commission VMS. (See Table 5 for a breakdown of the number of Member State vessels by ALC type).

2.3.2 Tamper-proofing ALCs

The draft ALC certification requirements section 2.6[8] require that the ALCs must be tamper-proof. An inspection procedure must be developed as part of the Commission's MCS function to ensure that the ALCs are not removed, tampered with or otherwise compromised in any way. This could be achieved either though the CCMs' own MCS functions, or perhaps in conjunction with an observer programme.

2.3.3 Average delivery time for report

According to the draft ALC certification requirements, paragraph 2.7.4[8], position data must be available to the WCPFC [Commission Secretariat] under normal operating conditions of the ALC and the Forwarding Service Provider (FSP), within 10 minutes of transmission from the ALC.

2.3.4 Vessel reporting frequency and vessel polling

Ideally, the Commission Secretariat should also be able to change the reporting frequency of the ALC. Paragraph 2.7.3 of the draft ALC certification requirements[8] specifies that the minimum interval for the provision of position reports must be at least 10 minutes and the maximum interval at least 24 hours or, for those with fixed reporting intervals, a frequency of hourly or better.

For Argos-based systems, the vessel reporting frequency cannot be changed remotely. These systems must therefore be set up to send a position report at a frequency of hourly or better in order to meet the Commission's requirements.

With Inmarsat-C-based systems it is possible to manually send a poll to the vessel requesting a position report. The ALC should respond with a current position report within 15 minutes from the sending of the poll. The criteria for modifying the reporting frequency should be detailed to ensure that this is only done under certain guidelines and only then for a specified period of time. This is to ensure that the additional costs incurred (that may or may not be recoverable) are not excessive. The cost of each additional poll will vary, but the figure of $0.13 provided by the representative of the American Tunaboat Association for individual messages on the INMARSAT network is likely to be indicative (Table 6).

[8] WCPFC Members' Vessel Monitoring System Certification Requirements for Automatic Location Communicators V1.0, 7 December 2005. Attachment E to the Summary Report of the First Meeting of the Technical And Compliance Committee of the Commission For The Conservation And Management Of Highly Migratory Fish Stocks In The Western And Central Pacific Ocean, Pohnpei, Federated States Of Micronesia, 5-9 December 2005.

2.3.5 Sizes and types of vessels to be covered

All the fleet components described in Section 2.1 will need to be covered by the Commission VMS. No minimum vessel size limit for VMS coverage has been defined by the Commission, although the issue of small vessels operating principally in coastal areas has received some discussion, and no timetable for the introduction of the Commission VMS to different portions of the fleet has been agreed. For the purposes of this study we have envisaged an implementation plan that starts with vessels 24m Length Overall (LOA) and above in the first instance. This reduces initial vessel numbers to about 2,500. However, we note that there are least as many vessels again that are less than 24m LOA (Table 1).

2.3.6 Staffing Requirements

The number of staff required to run a VMS depends in part on the number of vessels it covers. For comparison, the staffing levels (expressed in terms of Full Time Equivalents (FTEs)) of several existing VMSs are given in Table 2. There is clearly a minimum staff requirement, even for systems which cover only a few vessels (e.g. CCAMLR). As the number of vessels increases, so does the number of staff, but there are economies of scale such that the FTEs per 100 vessels actually drops. At the higher end of the range of vessel numbers in Table 2, the FTEs per 100 vessels is between 0.1 and 0.7. However, this is only a general relationship; the number of staff required also depends on the exactly what the VMS is expected to do. For a VMS used in real-time management of fisheries effort quota systems such as a days-at-sea scheme, the staff requirement is higher than for a VMS that is only used to ensure vessels do not enter and/or fish in a restricted area.

We recommend that the Commission VMS, at least initially, should have staffing levels at the lower end of the range of FTEs per 100 vessels (high-end services such as real-time restricted area and quota monitoring are not required at this stage). Minimum staffing levels are suggested in Table 3. Even if we assume that the VMS will cover only vessels 24m and above in the first instance, the number of vessels is likely to be above 2,500, therefore requiring at least 2.5 FTE of additional staff at the Commission Secretariat. To be safe, we therefore recommend that the Commission allow for three additional full time personnel to run the Commission VMS, consisting of one VMS manager and two VMS operators.

Table 2 Number of staff (Full Time Equivalents – FTEs) and Vessel Numbers for some Existing VMSs

Organisation	**Staff (FTE)**	**Number of vessels**	***Staff (FTE) / 100 vessels***
NEAFC	1.5	1473	0.10
Australia	1	500	0.20
US Northeast	2	529	0.38
US Pacific Island	1	200	0.50
FFA	6	1024	0.59
Chinese-Taipei	6	855	0.70
NAFO	1	135	0.74
US South East	2	269	0.74
US Northwest	3	297	1.01
New Zealand	2	129	1.55
Estonia	1.5	68	2.21
Falkland Islands	1	30	3.33
CCAMLR	1	27	3.70

Table 3 Recommended Minimum Staffing Levels for the Commission VMS

Number of Vessels covered by the Commission VMS	Additional Staff required in the Commission Secretariat (FTE)
1 – 100	1
101 – 1500	1.5
1501-2500	2
2501 – 5000	2.5

The desired level of experience and skill sets for each of these roles are described below along with the appropriate pay scale in the WCPFC classification structure;

VMS Manager (CROP Level K)

- Graduate level (or equivalent) education;
- Minimum of 6 years experience in fisheries management; MCS and VMS orientated experience essential;
- VMS management experience, setup of vessels and management of fleet operations;
- Good communications skills particularly liaison with fishing vessels and companies;
- Experience of ALC installation, inspection and operation;
- Large commercial fisheries experience essential, knowledge of tuna fisheries operations preferred;
- Database experience (SQL Server / Oracle most likely recruitment for VMS management).

VMS Operator (CROP Level J)

- Experience of VMS operation. (not essential but preferred);
- Experience of ALC installation, inspection and operation;
- Knowledge of tuna fisheries;
- Experience in database operation;
- Good communications skills particularly liaison with fishing vessels and companies.

2.3.7 Staff Training

The VMS service provider selected by the Commission must provide training for the Commission Secretariat staff who will be required to run the system. However other areas of training that should be considered for the optimal management of the VMS include:

- Database training that will be important for the operation of any VMS as all systems will incorporate a database which will require monitoring, maintenance, and backing up.
- Communications, especially internet protocols; most if not all the systems are likely to utilise Internet protocols such as FTP and HTTP, but they will also need to be secure, using encryption technologies such as SSH and SSL.

2.3.8 System capacity (hardware and software specifications)

The data loading of the system has been calculated to be 18Mb of data per day at a maximum, based on 497,993 fishing days[9] and a message size of 93 bytes [10]

The hardware configuration for the VMS will be a combination of a database server that will be the heart of the VMS and a client workstation for each member of staff required to monitor the VMS. The recommendations for minimum hardware specifications for the VMS database server and client machines are given below. Important features of the specification for the VMS database server are a fast processor, the large memory and the use of SCSI hard disks in a raid array. This is particularly important as it means that even if one of the discs fails, no data will be lost. The client workstations will just be used to monitor the VMS and so do not need to have the high specification of the server. However they should also have a reasonable size memory, because VMS software tends to be memory intensive. These are example specifications only; specific requirements should be provided by the VMS Service Provider:

Database Server

Dual Intel® Xeon processor 2.8GHz with 1MB L2 cache

1GB DDR2 SDRAM

17" Flat Panel Monitor

DVD-RW drive

Four 80GB 10,000rpm 1" U320 SCSI hard drives

Adaptec 39160 Ultra160 SCSI PCI based controller for a RAID 5 configuration

PV100T DAT72 36/72 GB Internal TBU (with internal SCSI cable)

Veritas Backup Exec Server Edition

Microsoft Windows Server 2003, Standard Edition with 5 Client Licenses

Client Workstations

Intel® Pentium® 4 Processor 2.8GHz, 1 MB cache, 800MHz FSB

512M DDR SDRAM Memory

80GB (7,200 rpm) Serial ATA Hard Drive

Intel® Graphics Media Accelerator 900 (utilizing up to 128MB of system memory)

17" Flat Panel Monitor (though access to larger screen / projector facilities preferable)

DVD-R/W

Integrated Broadcom 10/100/1000 Gigabit network

Microsoft® Windows® XP Professional With Media using NTFS

2.3.9 Links to Commission Vessel Record

A VMS requires a vessel list/registry to operate. If it is not linked to the current WCPFC Record of Fishing Vessels, a parallel registry will need to be created resulting in a duplication of effort in entering the information. This is both inefficient, and more importantly, creates a duplicate dataset,

[9] Flewwelling, P. (2002) WCPFC Regional Observer Programme Proposal

[10] FAO Technical Guidelines for Responsible Fisheries - Fishing Operations - 1 Suppl. 1 - 1. Vessel Monitoring Systems

which may result in inconsistencies in the data. To avoid this problem, data should be edited only in the WCPFC Record of Fishing Vessels and then made available to the VMS via the link between the systems. A similar system should operate in reverse for information in the VMS that is required by the WCPFC Record of Fishing Vessels.

Examples of data flows from the WCPFC Record of Fishing Vessels to the VMS include:

- Information on personalities connected with the vessel, such as Owners, Agents, Masters and there contact details.
- Information of the vessel specification such as GRT, Engine power, storage capacity;
- Information on the vessel history such as previous names and call signs.

Examples of data flows from the VMS to the WCPFC Record of Fishing Vessels include:

- Information on the current position/status of the vessel;
- Total number of days that the vessel has been in the Convention Area.

We note that the WCPFC Record of Fishing Vessels does not contain information on the current licensing status of fishing vessels, however, this information is needed by the VMS and will need to be sourced in another way.

The data that reside in a vessel registry such as the WCPFC Record of Fishing Vessels are relatively static; changes to data entities such as vessel size, and type are relatively rare, although there is a requirement that any change in this information has to be notified to the Commission Secretariat within 15 days of that change occurring. Linked data from the vessel registry in the VMS would therefore only have to be refreshed occasionally. To create a link, first there has to be a common data entity in both systems that can be used to create a relationship between the datasets. There also has to be a protocol for the interface between the two systems.

The data entity that would be most appropriate for linking the vessel registry and the VMS would be the WCPFC Identification Number (WIN). This number is unique to each vessel and is allocated by the flag State responsible for the vessel. It consists of:

a. the International Telecommunication Radio Call Sign (IRCS); or

b. if an IRCS has not been assigned, with the characters allocated by the International Telecommunication Union (ITU) to the member of the Commission concerned or such other characters of national identification as may be required under bilateral fishery agreements and followed by, as appropriate, the fishing authorization or vessel registration number assigned to the vessel by the member of the Commission concerned. In such cases, a hyphen shall be placed between the nationality identification characters and the licence or registration number identifying the vessel.

There are other unique identifiers such as the Lloyds Registration Number, however, no system is fool-proof and by using the WIN, any problems (such as duplicate numbers) can be resolved quickly.

If a dynamic link is required, a protocol for linking databases together, such as Open Database Connectivity (ODBC), could be used. This will work even if the databases are not using the same database architecture. In our view a dynamic link is essential; however, if a dynamic link is not required, data could be exported automatically from one system to the other. Tables could be exported overnight to reduce disruption of the system.

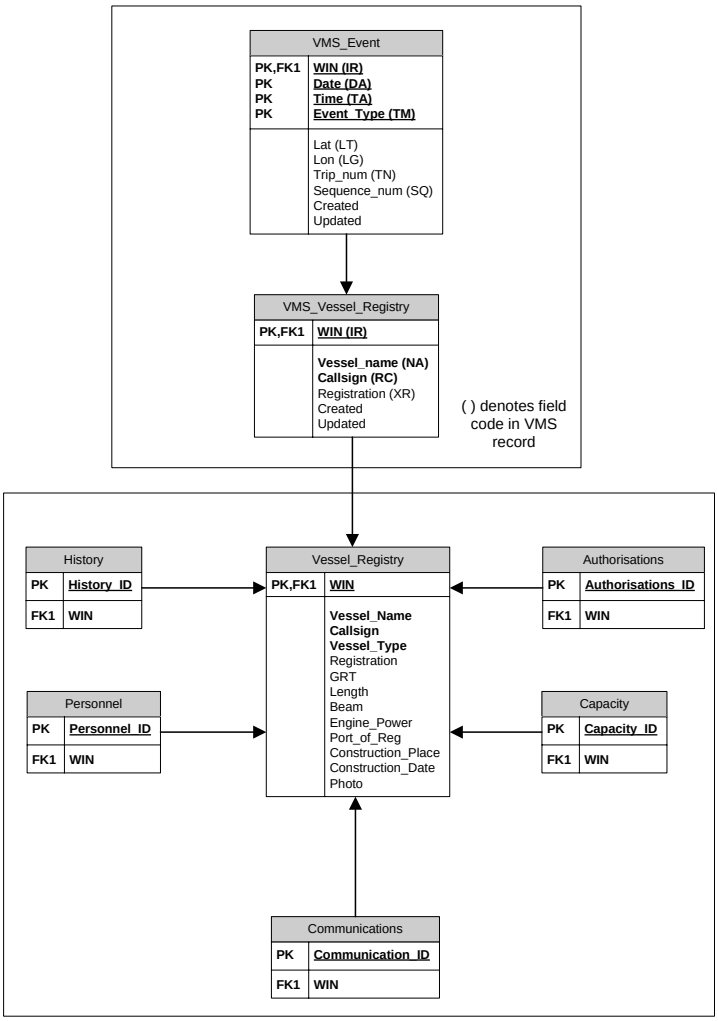

Figure 3 Schematic links to Commission vessel records

2.3.10 Security Requirements

The Ad Hoc Working Group [Data] meeting[11] has made a provisional identification of types of information and confidentiality classification. In this classification, VMS Vessel position, direction and speed was ranked in the highest risk category. Clearly the VMS will be handling data of a highly sensitive and confidential nature. VMS security has to be considered in the following areas:

- on the fishing vessels;
- between the fishing vessels and the Commission Secretariat;
- internally within the Commission Secretariat; and
- between the Commission Secretariat and CCM.

Security onboard the vessels is covered by the Commission draft rules on tamper-proofing of ALCs[8]. Providing these rules are not breached, there should be little additional security required on fishing vessels. All data transmission between fishing vessels and the Commission Secretariat should be through secure channels. If the Internet is to be used to deliver the data to the Commission VMS, encryption should be used between the Land Earth Station (LES) and the Commission Secretariat to ensure that:

[11] held at Manila, Philippines from 31 July-04 August 2006

- data received can be authenticated as being sent from a particular vessel;
- data have not been diverted or read by unauthorised persons; and
- data have not been changed since they left the vessel

The security requirements at the Commission Secretariat can be considered under the headings of physical and technical security.

2.3.10.1 Physical Security

The computers and related equipment (e.g. fax machines) used in the operation of the VMS should be placed in a secure room that is not accessible to unauthorised persons. The staff that manage the VMS operation should be trained and aware of the highly sensitive nature of the information held within the VMS and should be bound contractually by policy and procedure to ensure that information is not intentionally or inadvertently released.

2.3.10.2 Technical Security

Issues of technical security include:

- ***Security Assurance:*** Confidence that the VMS behaves in a way that is expected. This is achieved by making sure that software and hardware are capable of meeting the specification of the VMS; that the VMS is protected from attack and misuse by having appropriate firewall and anti virus protection; and that the operating systems on all servers and clients are kept up to date.
- ***Reliability of service:*** The VMS should always be available, except for planned periods of maintenance for server upgrades or other essential maintenance. This is achieved by using high quality hardware and software that is well maintained. There should be high quality IT infrastructure including high speed network cabling and internet connection. The infrastructure should be supported by an Uninterruptible Power Supply (UPS) to support the VMS and the network so that in the event of a power failure the VMS can continue operating. Any supporting hardware such as fax machines should also be connected to the UPS if possible.
- ***Backup and disaster recovery*** If the VMS does fail it should be restored quickly with minimal impact to the system. This is achieved by taking regular backups of both the data and the VMS state. Backups should be scheduled incrementally and also in such a way that the system can be restored to a specific point in time in the past. The back up media should also be stored securely and protected from accidental destruction, such as in a fire safe. Backup and recovery procedures must be tested at regular intervals to ensure that staff are familiar with the systems in place and that procedures are functioning correctly.
- ***Access Control****:* Access to the VMS must be restricted to authorised users of the system. Careful consideration should be given to defining what levels of access are appropriate for different users or user groups, making sure they are implemented correctly.
- ***Authentication*****:** The VMS should have a system of authenticating users and programs. This can be achieved using authentication on the operating system, such as windows logins, or at the application level.
- ***Accountability****:* Accountability is the ability to know who did what, when and where. Users are responsible and accountable for their actions. Actions can be monitored and recorded through the operating system by enabling logging of users' activities. Changes on the database that supports the VMS should also be monitored through transaction logging.

Almost all of these issues were covered in the consultations of the AHTG [Data]. The recommendation of the AHTG [Data] for the Secretariat to continue to develop its draft Information Security Policy, aspiring to ISO17795 standards, is a positive development in relation to all security issues associated with the Commission VMS.

2.3.11 Reporting VMS Data release rules

VMS data should only be provided to contracting parties that are actively engaged in surveillance and or inspections under the auspices of the Commission's MCS system and to prevent loss of life at sea. The data that can be provided are the previous 10 days of VMS reports, including all vessels within 100nm of any vessel of interest.

2.3.12 Published Vessel list

A list of vessels that are currently submitting VMS reports must be published in a secure part of the WCPFC web site. The inception report of the study on the Corporate Data Management System refers to a content management system (CMS) through which data can be uploaded for viewing on the web site. Full specification of this CMS will define how data need to be uploaded, however it is unlikely to require more than a text file or XML file generated from the VMS. This could be accomplished with a simple database query.

2.1.13 Support and maintenance

The VMS is a real-time, mission-critical system and so a high level of support is vital. Support is required in three areas:

- the VMS software itself;
- the database that supports the VMS software; and
- the network infrastructure on which it runs.

Support can often be provided remotely to staff members operating the VMS over the Internet or by direct telephone communication using remote control software.

2.4 Review of VMSs operated by other RFMOs

The Commission VMS has the potential to be the largest in the world operated by an RFMO. In this respect it is important to look at how other RFMOs have developed and are operating their respective VMSs to see what lessons can be learned.

Of those available for comparison, the three most appropriate are those operated by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the North Atlantic Fisheries Organisation (NAFO) and the North-East Atlantic Fisheries Commission (NEAFC) (Table 4). The FFA VMS is not specifically included in this comparison, because it is already closely linked with any potential Commission VMS solution.

The CCAMLR VMS is relatively small compared to the others, covering only 27 vessels, but provides an interesting comparison due to the way in which it was developed. Development started in the mid 1990s, culminating in1998 with the adoption of a Conservation Measure requiring each Contracting Party to establish its own VMS for its flag vessels that operated in the Convention Area. In 2001 the Conservation Measure was amended to require Contracting Parties to submit to the CCAMLR Secretariat data on vessel positions at a resolution of FAO statistical area within two (2) days of receiving the VMS data. Currently, the CCAMLR VMS is still based on flag State Fisheries Monitoring Centres that collect position data and forwarding them to CCAMLR. The position data must now be forwarded no later than 4 hours after being received by the flag State, although fishing vessels may also report directly to the Commission VMS if they wish. The emphasis on the parties carrying out the majority of the VMS functions has enabled CCAMLR to implement a VMS for the Convention Area with minimal direct involvement of the Commission Secretariat itself, while still receiving the data for the required management functions of the Commission.

The NAFO VMS covers approximately 200 vessels. Its primary function is to improve compliance in the Regulatory Area and, to this end, VMS data may be forwarded to NAFO inspectors. The NAFO VMS is also used to collect more than just position information. Other data include catch on entry to and exit from the Regulatory Area, transhipment reports, landing reports, daily catch reports and

observer reports. This has lead to the development of the North Atlantic Format (NAF) which was developed in conjunction with NEAFC. With a few minor modifications this has been used as a standard for VMS data reporting worldwide. For example, CCAMLR now uses a modified version of NAF for data reporting.

NEAFC operates a significantly larger VMS than both CCAMLR and NAFO, with 1,473 vessels in its system. However its core structure is similar in that the national Fisheries Monitoring Centres (FMCs) are responsible for collecting the data and then forwarding them to the NEAFC VMS. The NEAFC system also forwards data to inspectors in the same way as the NAFO system. NEAFC were partners with NAFO in the development of NAF.

In comparing the size and requirements of the WCPFC to other RFMO VMS solutions, the closest in terms of size and structure is NEAFC. The staffing levels therefore required to operate the NEAFC VMS are a good indicator of the staff required for the Commission VMS. The additional information collected through the NAF is also likely to be of future interest to the Commission.

2.5 Questionnaire responses from CCMs

The CCMs were contacted and requested to complete a questionnaire in order to collect information on the VMSs that are already operation in the Convention Area (both flag States and coastal States) and how they may interact with the Commission VMS. Opinions of both the relevant MCS Authorities and Fishing Organisations were sought. A full list of the people contacted is provided in Annex 1. Blank versions of the questionnaires are provided in Annex 2.

2.5.1 Member State MCS Authorities

Table 5 details the responses of the CCMs' MCS Authorities to the questions related to VMS operations. From the responses received it appears that a wide variety of VMS solutions are in place within the Convention Area for flag State vessels, working with both the Argos and INMARSAT satellite networks. The questions on the ability to forward and receive entry and exit reports for the VMS show that many of the Member States already have this facility, although in some cases it is a manual process, but all but one of the respondents would like to forward and receive entry and exit reports from the Commission VMS when vessels move across the border between the high seas parts of the Convention Area and the EEZ of a CCM. This should be one of the specific requirements in the tender for the Commission VMS. The procedure should be automatic, with reports being sent by email in an approved format to each coastal State VMS when required.

2.5.2 Member State Fishing Representatives

Table 6 contains the responses received from CCM-nominated Fishing Representatives, including information on the costs of equipment installation communications (who pays and approximate costs). This table shows that, with respect to regional VMSs currently in place, the costs are nearly all paid directly by the operators of the fishing vessels. Such cost recovery should be part of the model implemented by the Commission (see Section 5).

Table 4 Review of VMSs operated by other RFMOs

Regional organization	CCAMLR	NEAFC	NAFO
Membership	24 Member States (see www.ccamlr.org); 15 Actively Fishing	EU, Iceland, Norway and Russian Federation	Bulgaria, Canada, Cuba, Denmark (in respect of the Faroe Islands and Greenland), European Union, France (in respect of St Pierre et Miguelon), Iceland, Japan, Republic of Korea, Norway, Russian Federation, Ukraine, United States of America.
Fisheries monitored by VMS	Demersal longline for toothfish. All finfish trawl fisheries within the Convention Area, excluding some specific EEZs	All fisheries in the high seas area of the convention including: Bottom trawl; Pelagic trawl; Purse seiners; Longliners; Gill-netters	All fisheries (except tuna, salmon, crab, lobster, whale and sedentary species) in the NAFO Regulatory Area, the vast majority of which are: Trawl and Longline
Number of vessels monitored by VMS	Total: 27 Longline: 27	Total (2004) fishing for any species: 1 473 Authorized to fish for Regulated Resources: 800	135 (of the 224 registered to conduct fishing activities in the NAFO Regulatory Area): Trawl: 133 ; Longline: 2
Vessel size range	Longline: GRT 349 – 2 203	Any vessel 24 m overall length (or 20 m PP) which fish, or plan to fish, in the Regulatory Area	Trawl: 500 to 2 000+ ; Longline: 500 to 2 000+ . Note: Complete information not available on the vessel sizes.

Regional organization	CCAMLR	NEAFC	NAFO
Purpose of VMS monitoring	Monitor compliance with CCAMLR conservation measures in force; Provide additional information for patrols within the CCAMLR Convention Area conducted by CCAMLR Members; Assist with the verification of Dissostichus catch documents (DCDs).	To provide real time information regarding fishing vessel operations to NEAFC inspectors carrying out surveillance in the Regulatory Area according to the NEAFC Scheme of Control and Enforcement. NEAFC is the "second user" of VMS information. Data are transmitted from the vessels to their flag State Fisheries Monitoring Centre (FMC). Data concerning fishing vessels operating in the Regulatory Area are then re-transmitted from the flag State in real time to NEAFC.	To improve and maintain compliance with the Conservation and Enforcement Measures for vessels fishing in the NAFO Regulatory Area.
Tracking technologies	Shipboard equipment: Inmarsat-C, Argos Communications links: Inmarsat-C, Argos, Internet Control centre applications: Commercial off the shelf, customized for CCAMLR.	Shipboard equipment: Inmarsat, Argos, not excluding others. Communications links: Inmarsat, Argos, X.25 and Internet (HTTPS). Control centre application: Commercial, customized for NEAFC. NEAFC established the minimum data transfer requirements, and it is the responsibility of the Contracting Parties to impose technical requirements.	Shipboard equipment: Satellite monitoring device Communication links: x.25 (in the process being replaced), Internet (FTP and email), facsimile receivers

Regional organization	CCAMLR	NEAFC	NAFO
Security measures	Communications: encrypted internet, email Control centre: physical and electronic security measures.	Imposed by flag States	Shipboard: tamper-proof seals over transceivers Control centres: Individual security measures of Fisheries Monitoring Centre (FMC) of each flag State
Funding strategy	Establishment costs for control centre funded primarily by CCAMLR Catch Documentation Scheme (CDS) Special Fund (monies generated from the sale of seized and confiscated catches of Dissostichus spp.) Ongoing operations: CCAMLR General Fund	Fishing vessel operators fund shipboard equipment and communications costs. National FMCs are funded by flag State authorities, or the European Community. NEAFC's Secretariat Control Centre is funded through the organisation's annual budget.	Vessel operators fund transceiver purchase and installation. Flag States cover operational costs of their respective FMCs. NAFO Secretariat funds operational and maintenance costs of the VMS database server.
Staffing level	One half-time staff Each CCAMLR Member with monitored vessels has a designated CCAMLR VMS Contact Officer, but these are primarily engaged in national monitoring duties.	1.5 full time equivalent (full-time VMS IT & Statistics Manager, and part-time IT Assistant) Recently NEAFC's Contracting Parties established the "Advisory Group for Data Communications" (replacing the Ad Hoc Working Group on Computerisation) that will assist the organisation, its Contracting Parties, and any other organisation seeking advice on VMS issues and automated data transmission.	Within the Secretariat, the Fisheries Commission Coordinator, assisted by the Fisheries Information Manager, is responsible for VMS-related matters. Hardware administration is mainly outsourced, at present. Additionally, each flag State has a designated VMS officer at the respective FMC whose duty is to oversee that VMS reports from vessels are transmitted (either automatically or manually) to the VMS database server at the NAFO Secretariat.

Regional organization	CCAMLR	NEAFC	NAFO
Anticipated growth	Up to 50 vessels monitored on an annual basis.	Unknown. The number of vessels operating in the Regulatory Area will probably decrease over the coming years, but the volume of data transferred within the different requirements will continue to grow at the same rate as it has in the last few years (this includes VMS and other type of messages): 2001, over 103,000 messages 2002, over 142,000 messages 2003, over 205,000 messages 2004, over 304,000 messages	

FAO Fishing Technology Service (FAO-FIIT). c2005- .
Worldwide VMS Programmes - Worldwide VMS Programmes.
VMS Programme Factsheets

Table 5 Matrix of Member State responses to questionnaire

	Source of VMS	Argos Based	Inmarsat Based	No of vessel in zone	Forward Exit / Entry	Receive Exit / Entry	Would Like Exit / Entry Reports?
Australia	Developed with Absolute		X	70	Yes	Yes	Yes
Canada	Currently being Developed			Up to 70			
Chinese-Taipei	Independent	X (5%)	X([12]95%)	1588	No	Yes	Yes
Cook Islands				27			
European Community				96			
Federated States of Micronesia	FFA		X	3	Yes	Yes	Yes
Fiji							
France							
Indonesia							
Japan				1528			
Kiribati							
Korea				260			
Marshall Islands							
Nauru							
New Caledonia	Independent	X 18%	X 82%	26	No, would have to be manual process	Yes would have to be manual process	Yes
New Zealand	Independent		X	12	Yes with modification	Yes with modification	Yes
Niue	FFA and off the shelf Argos system	X	X		Yes for both system	Yes for both system	Yes
Palau							

[12] Approximate figure according to Member states, and Fishing Representative

	Source of VMS	Argos Based	Inmarsat Based	No of vessel in zone	Forward Exit / Entry	Receive Exit / Entry	Would Like Exit / Entry Reports?
Papua New Guinea	FFA, Domestic developed by Terra Vision and off the shelf Argos	X[13]	X	20	Yes for FFA , Possible for domestic system with reconfiguration	No	Yes
People's Republic of China				219			
Philippines				112			
Samoa							
Solomon Islands	FFA		X	4	Yes	Yes	Yes
Tonga	FFA and Argos system	X		12	Yes with some reconfiguring	Yes, Inmarsat format data would have to be converted to text or the Argos format before entering the system	Yes
Tuvalu	FFA		X		No	No	No
United Kingdom							
United States of America	Independent	X	X	556	Yes	Yes	Yes
Vanuatu			X	90	Yes	Yes	Yes

[13] Argos system is on trail with domestic fleet only

Table 6 Matrix of responses from Fishing Representatives

Country/ Representative	Vessels	VMS Type	Satellite	Costs					
				Equipment		Installation		Communications	
				Paid by	Cost	Paid by	Cost	Paid by	Cost
Australia/ Gary Heilmann Debrett Sea Food	Longliners Fishing in state EEZ and on the high seas	Flag State	Inmarsat	Paid By Fishing Operator	Approximately US$3400	Paid By Fishing Operator	Approximately US$150	By VMS authorities	Unknown
Chinese-Taipei/ Mr. Charles Lee, Secretary (for purse seiner), Taiwan Tuna Association	75 Longliners and 34 Purse seines. Licensed by Taiwan Fisheries agency for National EEZ and high seas, and with foreign EEZ by bilateral agreements	Flag state Other flag sates and RFMO, FFA and IATTC	Argos (mostly Indian Ocean) Inmarsat (mostly Pacific)	Paid By Fishing Operator	Onboard cost of ALC in range between US$ 4000-5000 For Inmarsat, For Argos range between US$1600 and 2000 Onshore costs for network and PC was US$1500	Paid by fishing operator	Onboard range between US$150-180 Onshore about US$150	Paid by fishing operator, VMS authority pays US$1500 per vessel for mandated DNID and software royalty	For Inmarsat cost for just position data is approximately US$350 a year on the basis of 6 to 10 position reports a day. Argos cost are approximately US$1000 a year for 30 position reports a day (approximately 9 cents per report), but this is a negotiated rate.

Country/ Representative	Vessels	VMS Type	Satellite	Costs					
				Equipment		Installation		Communications	
				Paid by	Cost	Paid by	Cost	Paid by	Cost
Federated States of Micronesia/ Milan Kamber Caroline Fisheries Corp., Inc.	2 Purse Seiners fishing in National EEZ and Foreign EEZ under licence	RFMOs specifically FFA	Inmarsat	Paid By Fishing Operator	Onboard cost of US$3500	Paid by fishing operator	Onboard approximately US$200	Paid by fishing operator	Onboard approximately US$1000 a year
Tonga/ Mr. Bill Holden, Alatini Fisheries Co	2 Long liners and 4 snapper drop liners Fishing in National EEZ only	Own Flag states VMS	Argos	One third Fishing operator/ one third Ministry of fisheries and on third AusAid	Onboard cost of US$3200 Software on shore was free from Argos	VMS Authority	Onboard approximately US$100	Paid by fishing operator	Subscription of approximately US$1200
United States of America/ Paul Krampe American Tunaboat Association	Purse Seine Fishing in National EEZ, Foreign EEZ and High Seas	RFMO specifically FFA	Inmarsat	Paid By Fishing Operator	Onboard cost of US$4000	Paid by Fishing Operator	Onboard cost of US$1000	Paid By Fishing Operator	US$ 0.13 per position report, plus US$200 maintenance a year
United States of America/ Peter H. Flournoy, International Law	Longline, Purse Seine,	Own Flag state and RFMO	Inmarsat	Paid By Fishing Operator and by VMS	Onboard cost between US$2000 and US$5000	Paid by VMS Authority	Onboard cost of US$1000	Paid By Fishing Operator	Varies, not specific cost available

Country/ Representative	Vessels	VMS Type	Satellite	Costs					
				Equipment		Installation		Communications	
				Paid by	Cost	Paid by	Cost	Paid by	Cost
Offices of San Diego	Pole and line, and Trolling Fishing in National EEZ, Foreign and high seas under treaty			Authority					

3 Technical specification of options

3.1 Option A – "FFA VMS Forwarding Solution"

3.1.1 Description

This option comprises two linked vessel monitoring systems; the existing FFA VMS based at the FFA Secretariat and a new VMS based at the Commission Secretariat (Figure 4). Under this option, the FFA VMS would be extended to cover the high seas portion of the Convention Area as if it were another FFA Member State EEZ. Position reports from all CCM vessels operating in the Convention Area (including within the EEZs of FFA Members) would be transmitted to the FFA Secretariat. Position reports for vessels operating on the high seas within the Convention Area would be forwarded automatically by the FFA VMS to the Commission VMS in as close to real-time as possible[14]. In effect, the Commission would be treated as if it were an additional member of the FFA VMS.

3.1.2 Commission Requirements

3.1.2.1 Hardware

The hardware required for the VMS at the Commission Secretariat will consist of a server to act as a database and communications server, and at least two client workstations at start up. The server will act as if it is an additional FFA Member State linked to the FFA VMS, covering the high seas parts of the Convention Area.

The exact computer specification will depend on the requirements of the link with the FFA VMS. It is critical that this specification be discussed and agreed with the FFA VMS supplier (or an external supplier providing the link to the FFA VMS) before installation to ensure that it meets both the provider's and the Commission's minimum specifications. At least two client workstations would be required to monitor the VMS at the start-up (it is not expected that the three VMS staff (see Section 3.1.2.4) would be accessing the system all of the time, and the VMS database should be accessible directly on the server, hence two workstations should be sufficient.

The specifications for the server detailed in Section 2.3.8 will provide this machine with sufficient capacity to act as both a database server and communications server for the VMS.

Provision of modems to communicate between the communications servers at the FFA Secretariat and the Commission Secretariat, would provide a short term back up in the event of the Internet link failing. A modem could also be used to provide an alternative method of connecting remotely to the server for maintenance and support issues.

The client machines are basic workstations with the majority of the mission-critical communications and intensive database work being performed by the server. The specifications detailed in Section 2.3.8 for the workstations will provide good high-end client workstations with a sufficient level of capability for them to remain useful for at least two to three years.

3.1.2.2 Software

The Commission Secretariat would be able to view the VMS reports from CCM vessels on the high seas in the Convention Area with minimal software installation. This information can be accessed either via a web link, or using a local clone of the FFA VMS, as is done by FFA Members. However, if the Commission wants to have more than just the capability to view vessel positions, it would need to purchase VMS database server and client software from current the FFA VMS provider to manage the VMS. Although it would be possible for the Commission to use an alternative third party VMS software package, given the close links with the FFA VMS in this option this would not be

[14] This can be regarded as being within a maximum of 15 minutes of the data arriving at the FFA Secretariat.

recommended. Each VMS client computer should have the standard set of office software available, along with connections to any internal Commission networked software.

3.1.2.3 Communications

Secure IDD telephone, fax lines and encrypted email should be provided (if not already existing) to the VMS Control Room at the Commission Secretariat. This will enable secure communications between the Commission and FFA staff managing the VMS, and maintain confidentiality for vessels fishing in the Convention Area. It is recommended that where possible Internet services for Voice Over Internet Protocol (VOIP) are utilised within the Commission Secretariat to minimise communication costs.

3.1.2.4 Staff

Three (3) staff would be required during the period leading up to full operation of the Commission VMS: one full time VMS manager and 2 fulltime VMS operators. Full descriptions of the roles, pay-scale equivalents and skill set requirements are in Section 2.3.6. Specific IT support to the VMS should be provided through a support contract with the VMS supplier with routine general IT support through the normal provision of such support at the Commission Secretariat. When the VMS is established and running smoothly, staffing levels can be re-evaluated.

3.1.3 FFA Requirements

3.1.3.1 Hardware

The significant increase in data traffic within the FFA VMS that would result from this option is likely to require additional server capacity for both the communications and data handling functions. Advice on the capacity of the current system and the expected impact of the expanded system needs to be obtained from the current FFA VMS supplier to more accurately predict the necessary increase in server capacity.

3.1.3.2 Software

The Convention Area and all EEZs would need to be programmed into the FFA VMS with appropriate rules to forward position data to the Commission VMS. A zone for the high seas of the Convention Area would need to be set up in the same way as FFA Member State EEZs are currently setup to enable the routing of position reports to the Commission VMS. The communications side of the FFA VMS software would have to be adapted to enable it to accept position reports from Argos ALCs as well as INMARSAT-C ALCs.

The FFA VMS is closely linked to the FFA Vessel Register that identifies vessels to which FFA members may issue fishing licences. The Commission equivalent would be more straightforward to manage as this would consist of flag State authorisations to fish – some of which are valid for up to five (5) years.

3.1.3.3 Communications

As for the Commission Secretariat (see Section 3.1.2.3)

3.1.3.4 Staff

It is likely that an additional VMS operator would be required at the FFA Secretariat to administer the additional vessel registrations, traffic volume and to deal with any polling requests from the Commission. Provision of this staff member should be covered by a service agreement between the Commission and FFA if this option was to be implemented.

3.1.3.5 Other Considerations

The FFA VMS currently accepts position reports only from vessels equipped with INMARSAT-C ALCs. This constraint would exclude those vessels that only have Argos ALCs on board (see Section 4.2 for additional discussion). For Option A to comply with the Service Level Requirements (Section 2.3.1), there would need to be a change in the FFA ALC type approval process such that Argos ALCs would be acceptable for vessels operating on the high seas on the Convention Area. This would in effect be the Commission ALC type approval process. There would not need to be a change in the type approval process for vessels fishing exclusively within the EEZs of FFA Members and the operation of the FFA VMS within FFA Members' EEZs would not change.

3.1.4 Vessel Requirements

3.1.4.1 Hardware

All vessels will be required to have onboard secure ALC (via the INMARSAT-C or Argos satellite networks) that meet the Commission's type approval specifications (to be agreed).

3.1.4.2 Communications

Communications equipment separate to the VMS transponder (including satellite phone/fax, email and radio) should be available on the vessels to enable secure two-way communications in the event of VMS breakdown. The details of each means of communications should be forwarded to both the Commission Secretariat and FFA Secretariat to enable direct contact in the event of a transmission failure of VMS reports, although it is possible that communication could be mediated through flag States rather than directly with the Commission and/or FFA. Vessels electing to use Argos would also be required to have operational a two-way communication system that would allow direct communication between the VMS operators and the vessel at all times (paragraph 24 of the TCC1 report, December 2005[15]).

3.2 Option B- "Independent Commission VMS Solution"

3.2.1 Description

Under Option B the Commission VMS would operate entirely independently of any other VMS in the region (e.g. FFA, flag State or coastal State VMS). All vessels operating in high seas parts of the Convention Area would submit position reports directly to the Commission Secretariat. There are no requirements from the standpoint of the FFA VMS under this option.

3.2.2 Commission Requirements

3.2.2.1 Hardware

The hardware required for the VMS at the Commission Secretariat will consist of one or more servers to act as a VMS database and communications server, and a number of client workstations. The number of servers required will depend on the setup of the VMS software package selected by the Commission to run the VMS. A client workstation will also be required for each member of staff that is required to monitor the VMS.

Outline specifications for the server and workstations are detailed in Section 2.3.8, and are similar to those described for Option A in Section 3.1.2.1.

3.2.2.2 Software

An open tender process should be used to obtain the best price VMS software solution that meets the required functionality. The final choice of VMS software may also have direct effects on the

[15] the Summary Report of the First Meeting of the Technical And Compliance Committee of the Commission For The Conservation And Management Of Highly Migratory Fish Stocks In The Western And Central Pacific Ocean, Pohnpei, Federated States Of Micronesia, 5-9 December 2005

hardware required to run the VMS, although the hardware proposed in this report is sufficient for most VMS solutions.

As for Option A, in addition to the VMS server and client software, each VMS client should have the standard set of office software available, along with connections to internally networked software.

3.2.2.3 Communications

These are the same as for Option A. This will enable secure communications between the Commission Secretariat and flag State staff managing their respective VMSs.

3.2.2.4 Staff

These are the same as for Option A (Section 3.1.2.4).

3.2.3 Vessel Requirements

3.2.3.1 Hardware

For the Commission VMS, these are the same as for Option A (Section 3.1.4.1). Note, however, that individual vessel requirements are likely to be greater under Option B than Option A, because a vessel may need more than one set of equipment to link up to different VMSs in different jurisdictions. At the least they will need the facility to modify the VMS reporting each time they cross a boundary, as described in Section 3.2.1.

3.2.3.2 Communications

These are the same as for Option A (Section 3.1.4.2).

3.3 Combined Scenario

3.3.1 Description

Under the combined scenario, vessels would be able to send their VMS data to the FFA Secretariat (Option A) or the Commission Secretariat (Option B) depending on their situation. CCM vessels that operate at any time of year within the scope of current FFA VMS, would continue reporting through that VMS when they are operating on the high seas in the Convention Area, as well as when they are inside the EEZs of FFA Members. While they are operating on the high seas in the Convention Area, their data would be forwarded automatically to the Commission VMS. Vessels that otherwise would not normally have to report to the FFA VMS, would report directly to the Commission VMS when they are active on the high seas in the Convention Area.

3.3.2 Commission Requirements

3.3.2.1 Hardware

The hardware required for the VMS at the Commission Secretariat would be the same as for Option B (Section 3.2.2.1).

3.3.2.2 Software

The VMS software requirements at the Commission Secretariat would be the same as for Option B (Section 3.2.2.2). The software setup would need to be configured to receive both VMS reports directly from ALCs on vessels, and the FFA VMS. As with Option A, this may require the Commission to purchase VMS server and client software from current the FFA VMS provider to manage the VMS.

3.3.2.3 Communications

The Communications requirements would be the same as for Option B (Section 3.2.2.3).

3.3.2.4 Staff

Staff requirements at the Commission Secretariat would be the same as for Option B (Section 3.2.2.4)

3.3.3 FFA Requirements

3.3.3.1 Hardware

The increase in data traffic that moves through the FFA VMS under the combined scenario would be less than for Option A, but may still be significant. It is likely that an upgrade to the current VMS hardware rather than additional hardware, would cope with the increased workload.

3.3.3.2 Software

The same as for Option A (Section 3.1.3.2).

3.3.3.3 Communications

The same as for Option A (Section 3.1.3.3).

3.3.3.4 Staff

An additional 0.25 FTE person would be sufficient to handle the increased workload at the FFA Secretariat to administer the additional traffic volume, vessel registration details and to deal with any requests for polling from the Commission. Provision of this staff member should be covered by the service agreement that will be required between the Commission and FFA under this option.

3.3.4 Vessel Requirements

3.3.4.1 Hardware

As for Option B (Section 3.2.3.1)

3.3.4.2 Communications

As for Option B (Section 3.2.3.2)

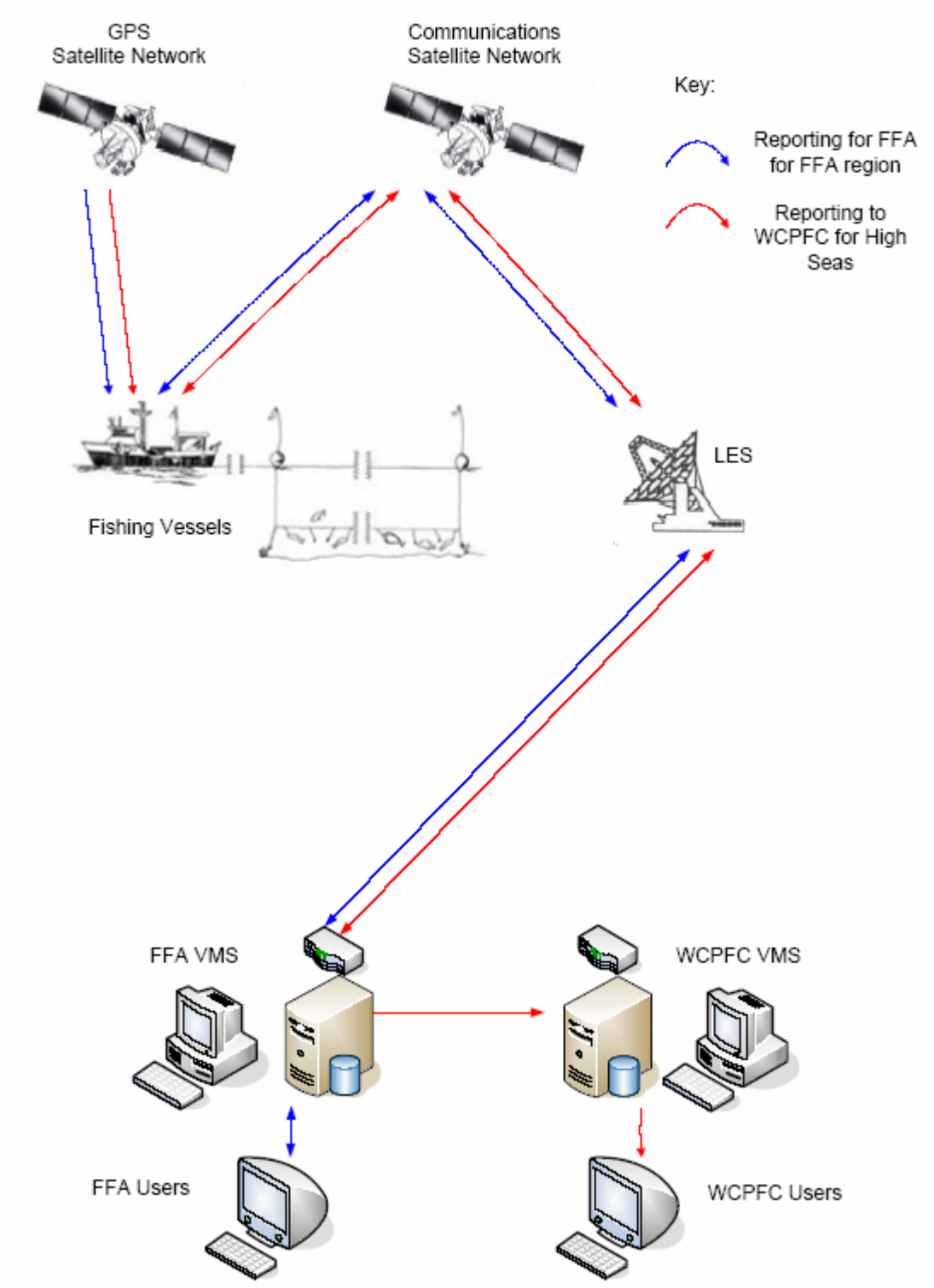

Figure 4 **Schematic Representation of Data Flows for Option A – "FFA Forwarding Solution"**

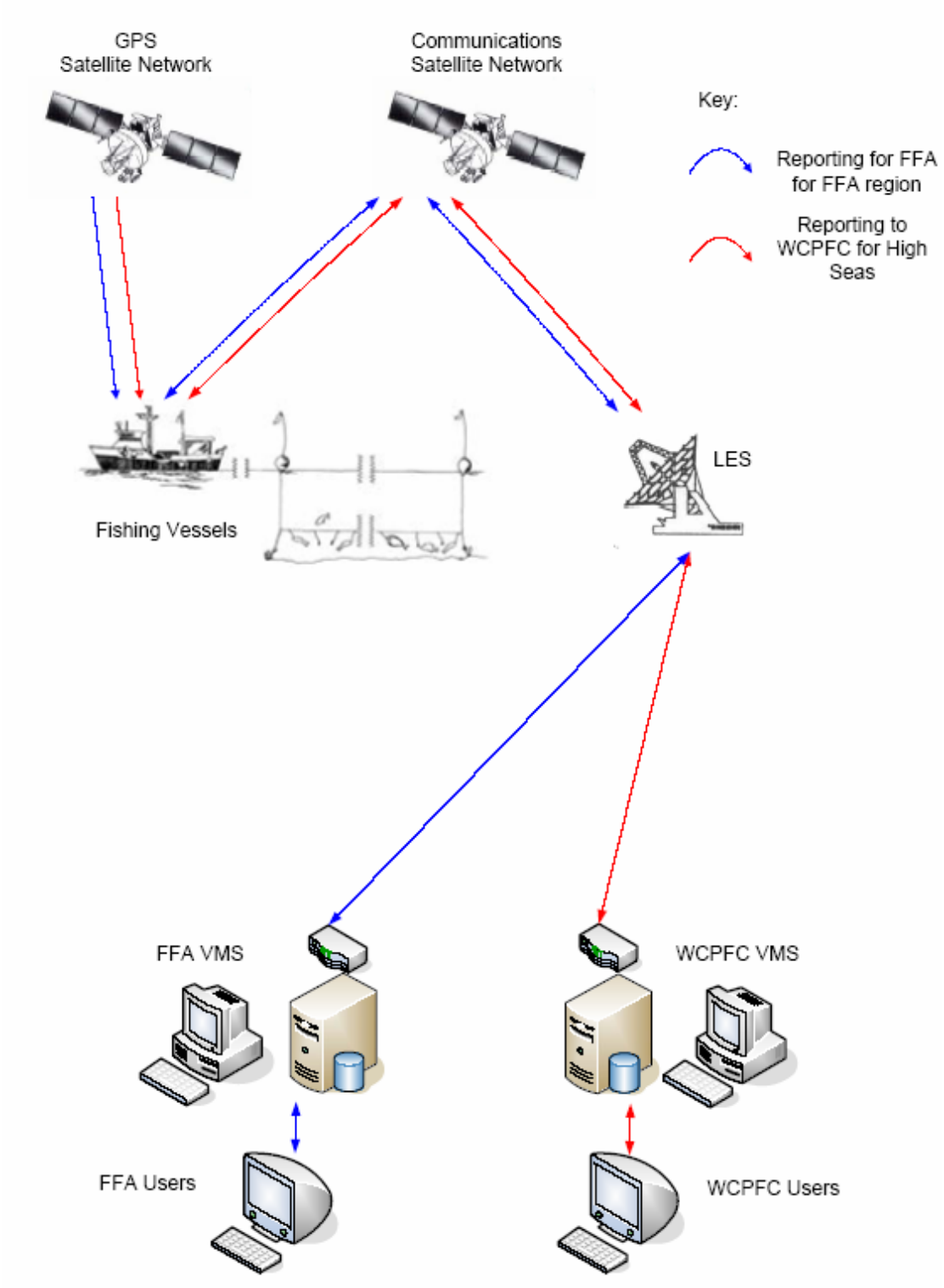

Figure 5 **Schematic Representation of Data Flows for Option B – "Independent Commission VMS Solution"**

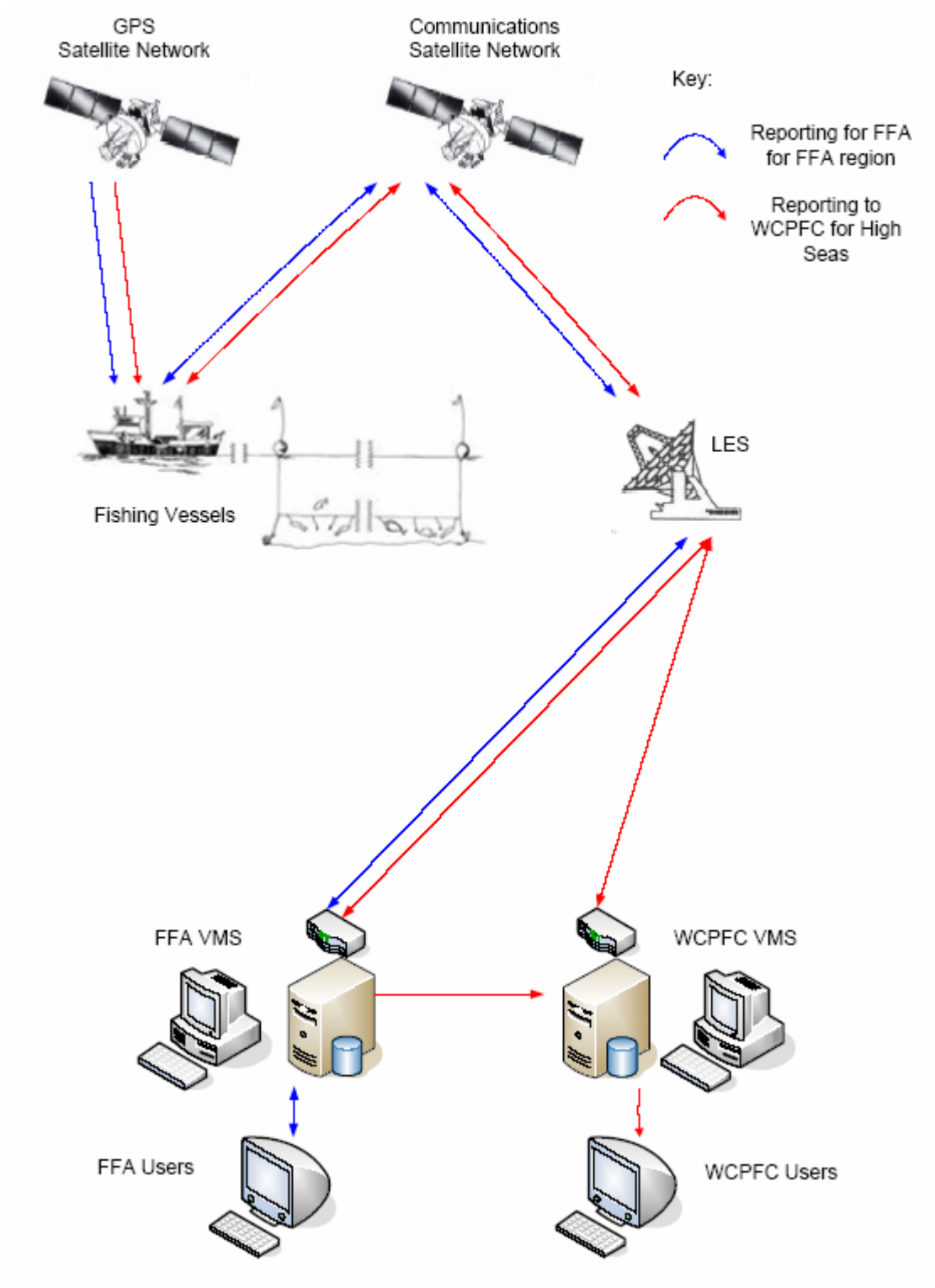

Figure 6 The "Combined Scenario" comprising both Options A and B

4. Technical evaluation of the options (SWOT)

4.1 Introduction

In this section we use SWOT analysis to structure the technical evaluation[16] of the options for the Commission VMS. SWOT stands for Strengths, Weaknesses, Opportunities and Threats. This is an analytical tool most commonly used to assess the strategic position of a commercial company or organisation. Strengths and weaknesses are internal characteristics of the organisation (in this case the Commission VMS), while opportunities and threats relate to the interaction between the organisation and its environment. We have used SWOT analysis as a means of structuring the assessment of the advantages and disadvantages of each of the VMS options. A separate table is presented for each option, and a third table is presented for both options combined – i.e. Option A for some vessels and Option B for others. The SWOT tables are categorised according to various service level requirements of the VMS in Section 2:

- VMS Implementation
- Coverage of Fleets
- Satellite Service Provider Requirements
- Tamper-proofing of units
- Vessel reporting frequency and vessel polling
- Sizes and types of vessels to be covered
- Staffing Requirements
- Staff Training
- System capacity (hardware and software specifications)
- Links to WCPFC Record of Fishing Vessels
- Security requirements
- Reporting VMS Data release rules
- Published Vessel list
- Support and maintenance

In the following sections we highlight key point from the SWOT that are expected to be more influential in decision-making on the Commission's preferred way forward, however, readers are referred to the tables for the full analysis.

The FFA Secretariat was contacted and requested to complete a questionnaire in order to collect information on the VMS that is already operation in the EEZs of FFA Members. This is of particular importance when determining the feasibility of Option A that relies on the ability of FFA to forward position reports to the Commission. A blank version of the questionnaire that was sent is provided in Annex 2.

4.2 Key points from the SWOT Analysis of Option A

Table 7 presents the complete SWOT analysis for Option A. The Key points from this analysis are as follows:

Strengths

[16] Note that issues of costs and available budget are not considered in this section. The projected costs of the various options and scenarios are presented in Section 5.

Option A is based on a proven VMS that is already operational in the region and on board a large number of vessels to be covered by the Commission VMS. A register of these vessels therefore already exists. This option would represent a clear advantage to vessels already reporting to the FFA VMS because they would only need to report to one VMS, whether they are fishing in the EEZ of an FFA Member State (which cover a significant part of the main fishing area of the Western and Central Pacific Ocean) or on the high seas in the Convention Area.

Although the FFA VMS is a distributed system, individual VMSs are centralised at the FFA Secretariat with FFA Member States remotely accessing their own VMS. This set up provides FFA Members with real time plotting of vessel movements and standard reports of vessel activity. For similar basic VMS functionality, therefore, there would be limited need for installation of VMS software at the Commission Secretariat. Commission VMS staff could access the VMS data via a web interface, or local clone of the FFA VMS. For more sophisticated capabilities, however, the VMS data themselves would need to be transferred locally to the Commission VMS. For this, it would be necessary to implement the more traditional "store and forward" approach and the Commission Secretariat would need a copy of the FFA VMS software.

Weaknesses

Only those vessels with INMARSAT-C transponders can currently be tracked, excluding vessels from some WCPFC CCM.

Only one supplier (i.e. the current FFA VMS supplier) would be able to supply the VMS for the Commission. This means that potential benefits from a competitive process to tender for the system may not be realised. In addition, the needs of the Commission VMS may end up being secondary to those of the FFA VMS. There would be data transmission costs between the FFA and Commission, but it should be possible to reduce these costs by using secure Internet protocols. Cost recovery would require good administrative links between the Commission VMS and FFA VMS operators.

The Commission Secretariat would not be able to poll vessels directly; they would have to request the FFA VMS operators to poll vessels instead.

Opportunities

From a technical standpoint, a very quick setup and installation of the system should be possible particularly for those vessels that are already reporting to the FFA VMS.

There is an opportunity for Commission VMS staff to gain experience and training from FFA VMS staff.

Threats

The major threats to the successful implementation of this option are in the initial setup of linkages between the FFA and Commission VMSs, and the subsequent management of CCM vessels in the Convention Area. There are two main threats as described below.

The first is that the mandate of the FFA VMS is to cover only vessels operating in the EEZs of FFA Members. Using the FFA VMS as the primary recipient of data from all CCM vessels operating on the high seas in the Convention Area and forwarding those data to the Commission VMS would be a major expansion of the coverage of the system. The FFA Secretariat does not yet have the authority from its Membership to agree to such an expansion and without such authority, Option A will not be viable. This will need to be addressed at an early stage in the process if Option A becomes the Commission's preferred solution.

Even if the FFA is able to expand its VMS to cover CCM vessels fishing on the high seas, CCMs may be unwilling to have their high seas VMS data sent to the Commission VMS via the FFA VMS. All data inside the FFA VMS are geo-fenced so each FFA Member can only access data from its own

EEZ. The FFA VMS operators have access to all the data but perform only system administration tasks and do not monitor the vessel movements.

The FFA VMS accepts position reports only from INMARSAT-C ALCs. This constraint is strictly enforced by the FFA ALC Type Approval Process that lists approved makes and models of ALCs and is required because the FFA Members have insisted on having the capability to poll vessels to remotely change reporting frequencies, or generate a one-off report. A significant proportion of the target fleet for the Commission VMS uses the Argos satellite network for their VMS reporting[17], but this system does not currently support polling (see also Section 2.3.4). In responding to a question regarding the potential to change the FFA VMS such that it could accept data from Argos ALCs, the FFA Secretariat responded that "*there is currently no instruction from the FFA members or FFC to change the Type Approval to accept ARGOS data and would be contrary to intent of the FFA ALC Type Approval.*" A derogation would be required only for vessels fishing on the high seas in the Convention Area and reporting to the Commission VMS via FFA VMS. Although this should not violate the intent of the constraint on the FFA ALC Type Approval, it appears that this might be a significant threat to the satisfactory implementation of Option A. Without a change to the FFA ALC type approval it will not be possible to monitor those vessels that have only an Argos ALC.

Another threat arises because a significant part of the Commission's VMS would be outside of the direct control of the Commission Secretariat. The Commission would be totally dependent on the FFA VMS to receive data from vessels. Relaying messages via the FFA VMS will increase the average time it takes for then to be received by the Commission Secretariat. A service agreement would need to be drawn up between the Commission and FFA detailing the explicit role of FFA Secretariat and the requirements of the Commission such as the time allowed between requesting a new vessel to be entered into the system and it becoming live on the system. These requirements would need to be agreed in detail, along with the appropriate level of financial compensation to FFA. The success of this potential solution would be threatened by the possibility that the Commission and FFA may not be able to reach a suitable agreement. In addition, any problem with, for example, hardware, software or communications at the FFA Secretariat or between the FFA Secretariat and the Commission Secretariat would immediately impact the Commission VMS.

4.3 Key points from the SWOT Analysis of Option B

Table 8 presents the complete SWOT analysis for Option B. The Key points from this analysis are as follows:

Strengths

Under Option B, data for the high seas portion of the Convention Area would be reported directly to the Commission VMS with no additional time delays and no other potential problems related to the routing of data through a third party. All vessels would report directly to the Commission in real-time at a frequency determined by the Commission. All staff associated with running the VMS would be employed by and under the control of the Commission, and the Commission Secretariat would be able to poll vessels directly. Fewer relays of the data mean that the chances of a security breach are reduced.

Weaknesses

The Commission Secretariat will have to develop and implement its own system for installing and verifying the installation of ALCs.

[17] Data collected during the preparation of this report do not permit the estimation of the number of vessels that carry exclusively Argos ALCs, but the data in Table 5 indicate that the number is significant: several vessels from New Caledonia, Niue, Papua New Guinea (see table above) Palau, Tonga and the USA and approximately 80 vessels from Chinese Taipei have Argos ALCs on board.

Option B will give rise to a duplication of effort for fishing vessels that operate in several different jurisdictions. For instance, a vessel that spends part of the year on the high seas in the Convention Area, part in one or more EEZs of FFA Members and part in the EEZs of a non-FFA coastal States will potentially need to report through three or more different VMSs, changing reporting mode each time it crosses a jurisdictional boundary.

Opportunities

In terms of procurement, Option B would enable the Commission Secretariat to use an open tender process to maximise the Commission's chances of sourcing a VMS that meets the Service Level Requirements at the best commercial rates from amongst all the current global VMS suppliers.

The Commission would be able to define its own type approval process for ALCs that could include both INMARSAT-C and Argos capabilities, while at the same time benefiting from regional experience from FFA in developing specifications for tamper-proofing and installation and inspection protocols. Up to date vessel registry information could be checked at the time the ALCs for each vessel are commissioned.

All the staff operating the VMS would be directly employed by the Commission, which would both allow for training to be concentrated at one site but also increase the security of the system by having all the related systems (e.g. VMS, vessel register etc.) kept within the one building.

FFA can handle and would appreciate the sending and receiving of reciprocal entry and exit reports when vessels move between FFA member EEZs and the high seas portion of the Convention Area. This is critical for the effective "hand-over" of vessels between the two VMSs.

Threats

Option B would, in effect, require the Commission Secretariat to start from scratch in sourcing and setting up the VMS. All vessels to be tracked would need to be added into the Commission VMS by the Commission staff. This would be a lengthy process and may delay the start of full operations. Also, there may be difficulties in recruiting suitable, qualified staff to be based at the Commission to run the VMS.

With the establishment of an independent VMS for the high seas portion of the Convention Area, it will be important to have close links with other VMS operators in the region to effectively manage the transfer of monitoring responsibility as a vessel crosses the boundary between zones of jurisdiction.

The Commission's chosen VMS provider may have difficulty in providing support to the Federated States of Micronesia (FSM).

4.4 Technical Evaluation of the combined scenario

We have not prepared a full separate SWOT analysis for the option of combining both Options A and B. The purpose of developing this scenario is to explore the potential advantages of following both options A and B simultaneously. The SWOT analysis of the separate options suggests that from a purely technical standpoint, depending on the vessels and flag States in question, either Option A or Option B could be preferred. For example, an FFA Member State vessel that is already reporting to the FFA VMS is probably going to prefer Option A, while a non-FFA Member State flagged vessel that does not operate in the EEZ of an FFA Member State, would probably prefer Option B. An assessment of whether a combined approach would mitigate the critical weaknesses and threats that have been identified in the two options separately, without adding any further significant problems, was undertaken.

The main purpose of the combined scenario would be to handle a number of issues more efficiently, including:

- Minimising changes for vessels that are already reporting to the FFA VMS

- Mitigating the concerns of CCMs regarding vessels that are not already reporting to the FFA VMS; and
- Reducing the costs of data transfer between FFA and the Commission.

The combined scenario would have the following advantages over the separate implementation of Option A:

1. Those CCMs that would prefer not to have their vessels' VMS data reported to the Commission VMS through the FFA VMS would have the option of reporting directly to the Commission VMS;
2. The Commission VMS would have the capability to accept reports from Argos ALCs, thereby removing the need for any further consideration of the FFA's ALC type approval process;
3. The Commission would be establishing its own standalone VMS capability and would not be wholly reliant on the FFA VMS. In the event of a central failure of the FFA VMS, affected vessels could relatively easily start reporting to the Commission VMS directly while fishing on the high seas in the Convention Area.

The combined scenario would have the following advantages over the separate implementation of Option B:

1. The Commission VMS would benefit from the experience of the successful implementation of the FFA VMS and those vessels that are already registered on that system could be brought on line with the Commission VMS relatively quickly;
2. Vessels already reporting to the FFA VMS would not have to do anything, other than be advised that they will need to continue to provide VMS reports while fishing on the high seas on the Convention Area;
3. The FFA experience of installing and verifying ALCs could be used by the Commission for developing their own protocols;

The following weaknesses of Options A and/or B would remain even under the combined scenario:

1. The onward transmission of data from the FFA VMS to the Commission VMS may introduce delays in the receipt of VMS reports for the affected vessels;
2. Data security is not wholly under the control of the Commission;
3. The onward transmission of data from the FFA VMS (or any other VMS) to the Commission VMS may introduce additional risk of a security breach;
4. The unconventional structure may make support more difficult;
5. As with Option A, it would be necessary to develop a service agreement between the Commission and FFA detailing the explicit role of FFA and the requirements of the Commission such as the time allowed between requesting a new vessel to be entered into the system and it becoming live on the system. These requirements would need to be agreed in detail along with the appropriate level of financial compensation to FFA. The success of this potential solution would be threatened by the possibility that the Commission and FFA may not be able to agree on a suitable agreement.

The following additional considerations arise under the combined scenario:

1. A dual commissioning process for ALCs may cause confusion.
2. The links that will be required to be put in place between the Commission and FFA will broaden the experience base of both Commission and FFA staff, although as for Option A, additional training of staff would be required at both the FFA and Commission Secretariats, as well as additional support and hardware and software maintenance, which would be beyond the control of the Commission.

In addition to these points, we note that while neither Option A nor Option B is intended to collect VMS data from within the EEZs of CCMs, both options could be modified to do this if particular CCMs requested it (see Section 0). In the case of Option A, VMS data are collected from CCM vessels within the EEZs of FFA Members (by the FFA VMS). They are not forwarded on to the Commission VMS, but they could be if a CCM so requested. The FFA VMS does not collect VMS data from non-FFA Member flag States operating outside their own national jurisdiction in the EEZ of another non-FFA Member. This includes Indonesia, Philippines, US Territories (Guam, American Samoa, Northern Mariana Islands), French Polynesia, New Caledonia, and Wallis and Futuna. A national authority may require the vessel to report to its national VMS, but there is no requirement for those data to be forwarded to either the FFA VMS or the Commission VMS. However, a VMS that is set up to both receive data directly from ALCs (Inmarsat and Argos) and receive forwarded reports from another VMS, as would be the case under the combined scenario (described in Section 3.3) would provide very useful knowledge and experience that would support the expansion of the Commission's VMS into the EEZs of CCMs if they request it, by whatever means (direct or indirect reporting) is deemed to be most efficient and most acceptable to stakeholders. Additional information on existing CCMs' VMSs is provided in Section 2.5.

Table 7 SWOT Analysis Table for Option A (FFA VMS Forwarding Solution)

Service level requirement	Strength	Weakness	Opportunity	Threat
VMS Implementation	Based on current proven system in operation at FFA.	Only one supplier (i.e. the current FFA VMS supplier) would be able to supply the VMS for the Commission. The Commission's VMS requirements may be secondary to the needs of the primary client (FFA).	Potential for very quick setup and installation of system, particularly with respect to vessels already covered by the FFA VMS.	Potentially only one VMS provider can provide the system that will link into this current working system which may lead to monopoly effects on pricing for software and support.
Description of Fleets	Many of the vessels to be covered under the Commission VMS are already registered under the FFA VMS. Vessels already covered by the FFA VMS would not need to report to another, separate VMS.	Only those vessels with INMARSAT-C transponders can currently be tracked, excluding vessels from some WCPFC Member States.		FFA does not have the authority from its Members to expand the FFA VMS to cover vessels on the high seas. Member States may be unwilling to have their VMS data for the high seas portions of the Convention Area routed through the FFA VMS.
Satellite Service Provider Requirements		Currently the FFA VMS does not accept Argos ALCs.		FFA Members may not allow Argos ALCs to be included within the system.
Tamper-proofing of units	The FFA system of installing and verifying ALC is well established.	No definition exists within FFA for tamper-proofing of Argos ALCs	Vessels that currently have to have Argos and Inmarsat ALCs may be able to rationalise on one system for VMS reporting.	The FFA system will not be able to incorporate the Argos ALCs without changing the current system.
Vessel reporting frequency and vessel polling		Relaying messages via the FFA will increase average time it takes for messages to get to the Commission VMS. The Commission Secretariat will not be able to poll vessels directly.		Extra steps in the process may cause the average time for messages to exceed the maximum required level.
Sizes and types of vessels to be covered		System only allows for INMARSAT-C, and smaller (and particularly artisanal vessels) may not have the power capacity for this type of equipment		Vessel coverage may be limited due to lack of approval for Argos ALCs..
Staffing Requirements		Commission VMS reliant on staff provision and training that is beyond their jurisdiction. This would need to be addressed by a	Links between the highly experienced and well trained VMS staff at FFA and the new Commission staff promotes skill	Reliant on third party provision of services

Service level requirement	Strength	Weakness	Opportunity	Threat
		Service Agreement between the Commission and FFA	exchange and broadens experience base of both Commission and FFA staff.	
Staff Training	Links will broaden experience base of both Commission and FFA staff.	Training of staff would be required at both FFA and the Commission.	Skill and experience transfer will be able to be increased.	Reliant on third party provision of training services.
System capacity (hardware and software specifications)		Reliance on third party for system support out of the control of the Commission.		Geographical location makes replacing equipment difficult and this is increased by dual site operation.
Links to Commission Vessel Record	FFA vessel register already well established.	Future addition the FFA register would have to be synchronised with Commission register.	Increased MCS links between Commission and FFA through the potential for shared vessel registries.	Reliance on third party to maintain vessel register, or additional development requirement to automatically synchronise Commission and FFA vessel registers.
Security requirements	Data stored at two remote sites is very unlikely to be destroyed by the same catastrophic event	Having two physical stores of data increases the risk of a security breach. Increase in the number of relays of data increases the risk of a security breach Responsibility for security is not fully under the control of the Commission.		There is a potential for problems related to data access at FFA for High Seas operations of vessels not fishing in FFA.
Reporting VMS Data release rules	N/A	N/A	N/A	N/A
Published Vessel list	N/A	N/A	N/A	N/A
Support and maintenance		If FFA VMS fails then Commission VMS will also not operate. Two sites have to be supported, and maintained.		Unconventional structure (message forwarding) may make support harder.

Table 8 SWOT Analysis Table for Option B (Independent Commission VMS Solution)

Service level requirement	Strength	Weakness	Opportunity	Threat
VMS Implementation	Define VMS requirements explicitly for Commission's own needs.		Independent VMS solution, provided at best commercial price from all current global VMS suppliers.	
Description of Fleets	All vessels would report directly to the Commission in real-time at a frequency determined by the Commission.		Up to date vessel registry information can be checked at VMS commissioning time.	All vessels will need to be added into the Commission VMS by the Commission staff. This will be a lengthy process and may delay the full operation of the VMS.
Satellite Service Provider Requirements	Independent VMS can track vessels from INMARSAT and ARGOS satellite networks.			Close links with other VMS operators in the region required to effectively manage the transfer of monitoring responsibility as a vessel crosses the boundary between zones of jurisdiction
Tamper-proofing of units		Need to establish own system of installing and verifying installation of ALCs.	Regional experience from FFA in developing tamper-proofing specifications would be invaluable.	
Vessel reporting frequency and vessel polling	Delivery times should be faster with direct reporting. The Commission Secretariat would be able to poll vessels directly.			
Sizes and types of vessels to be covered		There may be duplication of effort for vessels operating under the jurisdiction of the Commission VMS and other systems, such as the FFA VMS.	Flexibility in reporting routes may allow for additional sources of position reports other than Argos and INMARSAT-C. Argos may be a better solution for smaller vessels.	
Staffing Requirements	All staff would be under the authority of the Commission.			There may be difficulties in recruiting suitable, qualified staff to be based at the Commission to run the VMS.
Staff Training	Training can be concentrated at one site and under the control of the Commission.		Training may be beneficial to other areas of operation e.g. background for any staff working in MCS operations in general.	
System capacity (hardware and	Single site for hardware and			Geographical location makes

Service level requirement	Strength	Weakness	Opportunity	Threat
software specifications)	software for maintenance.			replacing equipment difficult for mission critical hardware elements.
Links to Commission Vessel Record	The link between the VMS and vessel register can be maintained over local network, which should make it more reliable and more secure.		Potential to reduce duplicating data in different locations, reducing ambiguity through direct database linkages.	
Security requirements	VMS Security under the direct control of the Commission. Fewer relays of data mean that the chances of a security breach are reduced.			The whole system could be destroyed by a single catastrophic event
Reporting VMS Data release rules	N/A	N/A	N/A	N/A
Published Vessel list	N/A	N/A	N/A	N/A
Support and maintenance	Single site is easier to maintain and support in a consistent way.		Support cost should be less for one site,	Provision of support to FSM may be difficult.

5 Cost Analysis

5.1 VMS Costs

All prices are quoted in US Dollars. Wherever possible, the projected costs for the VMS have been sourced directly from suppliers, with the notable exception of the service contract between FFA and the Commission which would be a requirement in Option A. The cost estimation for a service contract with the FFA has therefore been based on the additional staff, communications and hardware requirements that the provision of the service to the Commission would likely entail, with an additional service charge of 66 per cent of the staffing costs as is current FFA policy. The actual cost of the service would be subject to direct negotiation between the Commission and FFA.

Estimates of staff costs are based on the WCPFC Staff Regulations 2006. The position of the VMS Manager has been costed on the salary scale K4 and the VMS technician on the scale J1. We have factored in a possible increase of 14 per cent in the CROP/FFA salary scales that has been proposed for January 2007 among CROP agencies.

Detailed potential costs are provided in The relative impact of the start up and ongoing costs can be more clearly seen in 10. This provides a projected cash flow summary over a four year period (chosen as the period over which most assets can be depreciated).

Table 11 (Option A) Table 12 (Option B) and Table 13 (Combined Scenario). In these tables, the cost items have been identified as either capital, fixed or variable and have been further identified as either set-up or recurring costs. The values in the tables represent annual totals, as indicated in the first year of operation. The annual total for subsequent years therefore represent the ongoing costs only. A summary of the totals from the individual detailed tables is provided in Table 9 (first year costs) and Table 10 (on-going costs).

Table 9 Projected First year costs

	Total Year 1	Capital	Fixed	Variable	Start up	Ongoing
Total Option A	440,549	18,520	380,574	41,455	44,020	396,529
Total Option B	533,977	166,845	274,177	92,955	236,345	297,632
Combined Scenario	574,764	174,445	307,364	92,955	243,945	330,819

Table 9 shows the relative operating costs of the two main options and the combined scenario during the first year. Option A offers a significantly reduced capital expenditure as there is a reduced requirement for the initial purchase of VMS software and hardware. However, it is offset by higher annual operating costs due to the continued requirement for support from the FFA (see column “Ongoing” in Table 9).

Table 10 Projected Cash Flow Summary over 4 years

	Year 1	Year 2	Year 3	Year 4	Total
Total Option A	440,549	408,425	420,678	433,298	1,702,951
Total Option B	533,977	306,561	315,758	325,230	1,481,526
Combined Scenario	574,764	340,743	350,966	361,495	1,627,967

The relative impact of the start up and ongoing costs can be more clearly seen in Table 10. This provides a projected cash flow summary over a four year period (chosen as the period over which most assets can be depreciated).

Table 11 Detailed Cost matrix for option A

Description of cost	Units	Unit Cost	Total	Capital	Fixed	Variable	Start up	Ongoing
Hardware								
Server	0	5,600	-	✓			✓	
Workstations	3	1,475	4,425	✓			✓	
UPS Battery Backup (server)	0	325	-	✓			✓	
UPS Battery Backup (client)	3	115	345	✓			✓	
modem backup	1	200	200	✓			✓	
Printer	1	550	550	✓			✓	
Software & Support								
VMS software & installation	0	150,000	-	✓			✓	
Remote VMS Support Contract	0	22,000	-		✓			✓
Office Professional Software	3	600	1,800	✓			✓	
Service Contract FFA ***								
Additional personnel	1	76,474	76,474		✓			✓
Communications/additional vessel setup	2500	5	12,500			✓		✓
Server	1	5,600	5,600	✓			✓	
Router/vpn	1	2,000	2,000	✓			✓	
Data Communications	0.25	5,800	1,450		✓			✓
Management charge (66% staff costs)	1	50,473	50,473		✓			✓
Personnel								
Recruitment/relocation	1	15,000	15,000			✓	✓	
Salary Package		-	-		✓			✓
VMS Manager (Professional K4)	1	64,924	64,924		✓			✓
Additional benefits	1	32,854	32,854		✓			✓
VMS Technician (Professional J1)	2	48,215	96,430		✓			✓
Additional benefits	2	28,259	56,518		✓			✓
Training			-					
VMS Training	0	14,000	-			✓	✓	
Database training	1	10,500	10,500			✓	✓	
Communications			-					
Permanent Internet Connection	0.25	5,800	1,450		✓			✓
Calls to vessels/agents to setup arrange/ verify successful entry	0	5	-			✓		✓
Other phone calls	3	600	1,800			✓		✓
secure fax line	1	200	200			✓		✓
Office Costs								
Furniture/per person	3	1,200	3,600	✓			✓	
Consumables/per person	3	485	1,455			✓		✓
Security and other infrastructure (provided)			-					
Secure room for VMS			-	✓				✓
Utilities			-		✓			✓
e-mail						✓		✓
			Total	**Capital**	**Fixed**	**Variable**	**Start up**	**Ongoing**
Total Option A			440,549	18,520	380,574	41,455	44,020	396,529

Table 12 Detailed Cost matrix for option B

Description of cost	Units	Unit Cost	Total	Capital	Fixed	Variable	Start up	Ongoing
Hardware								
Server	1	5,600	5,600	✓			✓	
Workstations	3	1,475	4,425	✓			✓	
UPS Battery Backup (server)	1	325	325	✓			✓	
UPS Battery Backup (client)	3	115	345	✓			✓	
modem backup	1	200	200	✓			✓	
Printer	1	550	550	✓			✓	
Software & Support								
VMS software & installation	1	150,000	150,000	✓			✓	
Remote VMS Support Contract	1	22,000	22,000		✓			✓
Office Professional Software	3	600	1,800	✓			✓	
Service Contract FFA ***								
Additional personnel	0	76,474	-		✓			✓
Communications/additional vessel setup	0	5	-			✓		✓
Server	0	5,600	-	✓			✓	
Router/vpn	0	2,000	-	✓			✓	
Data Communications	0	5,800	-		✓			✓
Management charge (66% staff costs)	0	50,473	-		✓			✓
Personnel								
Recruitment/relocation	3	15,000	45,000			✓	✓	
Salary Package		-			✓			✓
VMS Manager (Professional K4)	1	64,924	64,924		✓			✓
Additional benefits	1	32,854	32,854		✓			✓
VMS Technician (Professional J1)	2	48,215	96,430		✓			✓
Additional benefits	2	28,259	56,518		✓			✓
Training (consultant days)	-		-					
VMS Training	1	14,000	14,000			✓	✓	
Database training	1	10,500	10,500			✓	✓	
Communications			-					
Permanent Internet Connection	0.25	5,800	1,450		✓			✓
Calls to vessels/agents to setup arrange/ verify successful entry	4000	5	20,000			✓		✓
Other phone calls	3	600	1,800			✓		✓
secure fax line	1	200	200			✓		✓
Office Costs								
Furniture/per person	3	1,200	3,600	✓			✓	
Consumables/per person	3	485	1,455			✓		✓
Security and other infrastructure (provided)			-					
Secure room for VMS			-	✓				✓
Utilities			-		✓			✓
e-mail						✓		✓
			Total	**Capital**	**Fixed**	**Variable**	**Start up**	**Ongoing**
Total Option B			533,977	166,845	274,177	92,955	236,345	297,632

Table 13 Cost matrix for the combined scenario

Description of cost	Units	Unit Cost	Total	Capital	Fixed	Variable	Start up	Ongoing
Hardware								
Server	1	5,600	5,600	✓			✓	
Workstations	3	1,475	4,425	✓			✓	
UPS Battery Backup (server)	1	325	325	✓			✓	
UPS Battery Backup (client)	3	115	345	✓			✓	
modem backup	1	200	200	✓			✓	
Printer	1	550	550	✓			✓	
Software & Support								
VMS software & installation	1	150,000	150,000	✓			✓	
Remote VMS Support Contract	1	22,000	22,000		✓			✓
Office Professional Software	3	600	1,800	✓			✓	
Service Contract FFA ***								
Additional personnel	0.25	76,474	19,119		✓			✓
Communications/additional vessel	0	5	-			✓		✓
Server	1	5,600	5,600	✓			✓	
Router/vpn	1	2,000	2,000	✓			✓	
Data Communications	0.25	5,800	1,450		✓			✓
Management charge (66% staff costs)	1	12,618	12,618		✓			✓
Personnel								
Recruitment/relocation	3	15,000	45,000			✓	✓	
Salary Package		-			✓			✓
VMS Manager (Professional K4)	1	64,924	64,924		✓			✓
Additional benefits	1	32,854	32,854		✓			✓
VMS Technician (Professional J1)	2	48,215	96,430		✓			✓
Additional benefits	2	28,259	56,518		✓			✓
Training	-		-					
VMS Training	1	14,000	14,000			✓	✓	
Database training	1	10,500	10,500			✓	✓	
Communications			-					
Permanent Internet Connection	0.25	5,800	1,450		✓			✓
Calls to vessels/agents to setup arrange/ verify successful entry	4000	5	20,000			✓		✓
Other phone calls	3	600	1,800			✓		✓
secure fax line	1	200	200			✓		✓
Office Costs								
Furniture/per person	3	1,200	3,600	✓			✓	
Consumables/per person	3	485	1,455			✓		✓
Security and other infrastructure (provided)			-					
Secure room for VMS			-	✓				✓
Utilities			-		✓			✓
e-mail						✓		✓
			Total	**Capital**	**Fixed**	**Variable**	**Start up**	**Ongoing**
Total Combined Scenario			574,764	174,445	307,364	92,955	243,945	330,819

In addition, a modest three (3) per cent inflation rate between years has been used for the ongoing costs in this table. It is apparent from this that Option B has the lowest cost in the long term. Option B also has the added advantage of providing the least exposure to the risk of the FFA using their position as a sole supplier to progressively inflate the service charges in Option A. Under the combined scenario, the Commission should be somewhat protected from this because it will have the alternative of using its own VMS if necessary.

5.2 Cost Recovery

The operational costs outlined in this proposal could be fully recovered by levying an annual registration fee on the CCM. This method is commonly used by the operators of other regional VMSs. Specifically, this is the method used by the FFA Secretariat with a current registration fee of $1,345 per annum. Given the modest staffing levels proposed for the Commission Secretariat, and the current data available, this registration fee could be applied on an individual vessel basis irrespective of catch and effort and should be simple to administer. The Commission Secretariat would receive the fee directly from the CCMs. It would be the responsibility of the individual CCM to pass the charges on to the fishing operators. Any option involving a third party VMS forwarding data to the Commission VMS will require good administrative links between the respective VMS operators.

Table 14 indicates the level of the annual registration fee required in order to recoup full costs over a four year period for Options A and B and the combined scenario.

Table 14 Registration fees for recouping total costs

		Number of Registered Vessels			
	Average Annual cost	2000	3000	4000	5000
Total Option A	425,738	213	142	106	85
Total Option B	370,382	185	123	93	74
Combined Scenario	406,992	203	136	102	81

Annex 1 - People Contacted During the Preparation of this Report

Person	Position	email	Delivered	Read Receipt	Responded	Received
Australia						
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Canada						
Blair Hodgson	Director International Pacific	hodgsonb@dfo-mpo.gc.ca	x	x	x	x
Cook Islands						
Mr Edwin Pittman,	Secretary, Ministry of Foreign Affairs & Immigration,	secfa@mfai.gov.ck or region@mfai.gov.ck	x	x	x	
Carl Hunter	Director	secfa@mfai.gov.ck or region@mfai.gov.ck	x			
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Staffan Ekwall	Desk Officer of WCPFC Affairs	Staffan.ekwall@cec.eu.int	x	x	x	
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Bernard Thoulag	Executive Director	mmafish@mail.fm or Bernardt@mma.fm	x	x	x	
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	Glen Joseph	Director	gjoseph@mimra.com	x	x		
Nauru							
	Marcus Stephen	Chairman	chairman@naurufisheries.com				
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Palau							
	Hon. Fritz Koshiba	Minister	tunapal@palaunet.com	x			
	Theo Isamu	Director	Theoisamu@yahoo.com	x			
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Mr. Ulunga Faanunu	Deputy Secretary for Fisheries	ulungaf@tongafish.gov.to	x	x		
Tuvalu						
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Nikolasi Apinelu	Acting Director of Fisheries (Ag)	apinelu@yahoo.com	x	x	x	
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United States of America						
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William Robinson	Regional Administrator	bill.robinson@noaa.gov	x	x	x	x
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Tony Taleo		ttaleo@gmail.com				x

Annex 2 - Blank Questionnaires

Questionnaire of Member States of the Western Central Pacific Fisheries Commission on the operation of VMS in the convention area.

MRAG (www.mrag.co.uk) has been contracted by the Western Central Pacific Fisheries Commission (WCPFC) Secretariat to undertake a feasibility study on setting up a Vessel Monitoring System (VMS) to cover the high seas area covered by the WCPFC. As the first stage of the study we are determining the operating environment that a Commission VMS would have to work in. Since the Member States are the key stakeholders in defining that environment we would like to ask some questions on current VMS activity in your jurisdiction and your opinion on the options being considered by the WCPFC.

I would appreciate it if you could please return completed questionnaires as soon as possible, but no later than the 15th of July to Conor O'Kane at c.okane@mrag.co.uk, If you would like any further explanation of the study or of the questions below, please address to them to Conor O'Kane at the above address.

Q1) Please provide us with details of fishing vessels flying your flag that operate in the area covered by the WCPFC. As a minimum we are seeking the following information:

- the type of vessel (by fishing method);
- gear types on board;
- vessels size (length over all and gross registered tonnage);
- the general area of operation and whether the vessel is currently active in the WCPFC Area;
- whether or not the vessel has an Automatic Location Communicator (ALC) on board; and
- where an ALC is being used, which satellite system it is using.

Q2) Please provide us with details of any Vessel Monitoring System (VMS) being operated by yourselves.
Please indicate which satellite/communications system is your VMS based on

A) Argos
B) Inmarsat
C) Other (Please Specify)

……..

Q2.1) Please could you indicate how your VMS was developed
A) In Country
B) With a VMS Supplier (Please Specify Supplier)

……..

Q3) When vessels cross the boundary between your VMS and the Commission VMS, would it be possible for your VMS to forward exit and entry reports to the Commission?

A) Yes
B) No

Q3.1) Would you want reciprocal entry exit reports from the Commission VMS?

A) Yes
B) No

~~**Q4)**[18] There are two options being considered by the WCPFC for the provision of a VMS to cover the high seas area.~~

~~**Option A**, has two VMS with the FFA VMS forwarding relevant high seas data to the Commission VMS; and~~

~~**Option B**, has two separate VMS, commission VMS for the high seas and FFA VMS for FFA member EEZs~~

~~For more details on the options see the WCPFC summary of options document at http://www.wcpfc.org/tcc1/pdf/WCPFC-TCC1-13.pdf~~

~~Would you have any objections to data being forwarded from the FFA Secretariat to the Commission as proposed in Option A?~~

~~A) Yes~~
~~B) No~~

~~If 'yes', please pick one or more of the options below:~~
~~A) As a matter of principle~~
~~B) As a matter of data security~~
~~C) Other (Please Specify)~~

……

Q5) Please nominate representatives of the fishing industry in your country whom we could contact to seek their views on the structure and operation of the VMS for the WCPFC Area.

Thank you for taking the time to complete this questionnaire.

[18] After the questionnaire had been sent out, Question 4 was deleted at the request of the Commission Secretariat. The question is included here for completeness, but was not considered during the study.

Questionnaire for representative of the fishing industry in the WCPFC

MRAG (www.mrag.co.uk) has been contracted by the Western Central Pacific Fisheries Commission (WCPFC) Secretariat to undertake a feasibility study on setting up a Vessel Monitoring System (VMS) to cover the high seas area covered by the WCPFC. As the first stage of the study we are determining the operating environment that a Commission VMS would have to work in. Since the operation of a VMS is primarily concerned with the vessels we would like to find out the experience of operating VMS from the perspective of the representatives of the vessels. Your government nominated you as a suitable representative for this study and I hope you will be able to find the time to answer the questions below.

I would appreciate it if you could please return completed questionnaires as soon as possible, but no later than the 26th of July to Conor O'Kane at c.okane@mrag.co.uk, If you would like any further explanation of the study or of the questions below, please address to them to Conor O'Kane at the above address.

1) What type and number of vessels do you operate / represent?: (please indicate all that apply)

Longline
Purse seine
Pole and Line
Trolling
Other: please specify

……..

What areas they are licensed for?: (please indicate all that apply)

a) National EEZ only
b) High Seas
c) Foreign EEZs under licence
d) Other (Please Specify)

……..

2) What Vessel Monitoring Systems are they a part of (please indicate all that apply)

a) Own flag State
b) Other flag State
c) Regional Fisheries Body (e.g. FFA, CCAMLR)

3) What communications system is the VMS based on? (please indicate all that apply)

a) Argos
b) Inmarsat
c) Other (Please Specify)

……..

3.1) What is the geographical coverage of the system?

a) EEZ
b) Regional
c) Global

4) Please indicate who paid for the following with regard to the VMS

4.1) The equipment required to operate VMS:

a) Your fishing company/fishing association
b) VMS authority
c) Other(Please Specify)

…….

4.11) Please indicate the approximate cost of the equipment required

(a) On-board
(b) On-shore

4.2) The installation of VMS on vessel

a) Your fishing company/fishing association
b) VMS authority
c) Other(Please Specify)

…….

4.21) Please indicate the approximate cost of the installation

(a) On-board
(b) On-shore

4.3) The Communications cost associated with running the VMS

a) Your fishing company/fishing association
b) VMS authority
c) Other(Please Specify)

…….

4.31) Please indicate the annual, per-vessel cost of the communications related to VMS operation.

Questionnaire for FFA on the operation of a VMS in the Convention Area (MRAG July 2006)

MRAG has been contracted by the Secretariat of the Western Central Pacific Fisheries Commission (WCPFC) to undertake a feasibility study on the setting up a Vessel Monitoring System (VMS) to cover the high seas area within the remit of the WCPFC. This will result in the preparation of a paper to be presented at the next meeting of the Technical and Compliance Committee in September 2006. As part of this study we are describing the operating environment within which a Commission VMS would work

There are two options being considered by the WCPFC for the operation of its VMS: **Option A** has two VMS with the FFA VMS forwarding relevant high seas data to the Commission VMS; and **Option B** has two separate VMS, Commission VMS for the high seas and FFA VMS for FFA member EEZs
(http://www.wcpfc.org/tcc1/pdf/WCPFC-TCC1-13.pdf):, Option A requires close cooperation between the FFA and the Commission in order to make the Commission's VMS operational. It would therefore be very helpful if you could provide answers to the following questions as part of our feasibility study:

Q1) Does FFA currently have a remit to be able to cooperate with the WCPFC in the way outlined in Option A (principally to allow the forwarding of data to another VMS)? If not, would it be possible to modify its remit as needed?

Q2) Does FFA have the human resources needed to support Option A? If not, would FFA be able to find/support extra staff if it is necessary? If so how much would such additional local resources cost to recruit and employ?

Q3) With your detailed knowledge of the operation of the FFA VMS, how would you suggest that relevant VMS data are best forwarded from FFA to WCPFC, and what sort of time delays would you estimate being involved? (i.e. the time difference between a position report being received at FFA and subsequently received at WCPFC.) Can you provide MRAG with contact details for the FFA VMS service provider and grant permission for us to speak to them in detail about the FFA VMS?

Q4) Is there a physically secure place to for a VMS that is forwarding data to WCPFC separate to the current FFA VMS, and are there secure communication links available between the FFA and WCPFC? This is to provide an option in which data outside of the FFA area that pass through the FFA VMS are not visible to all FFA VMS users.

Q5) The WCPFC system is likely going to be receiving position information from vessels using Argos and Inmarsat ALC's. Although this will not modify any requirement for the FFA Member States to accept Argos ALCs within their

waters, the FFA VMS would have to accept data from both types of ALC. Please can you indicate if this is currently possible?

Q6) Do you have any other views on the benefits or costs in implementing a WCPFC VMS through the FFA VMS as an intermediary (Option A) or having two separate systems in place (Option B)?

Q7) Would it be possible for the FFA VMS to automatically forward exit/entry reports to a Commission VMS under Option B, when vessels cross the boundary between FFA Member waters and the waters covered by the Commission VMS?

A) Yes
B) No

Q7.1) Would the FFA VMS be capable of receiving reciprocal entry/exit reports from the Commission VMS?

A) Yes
B) No

Q7.1) and would you wish to receive such reports?

A) Yes
B) No

Questionnaire for WCPFC on the operation of a VMS in the Convention Area

In our analysis of the operating environment we have concentrated on four key documents, The review of VMS standards WCPFC-TCC1-13, The Summary report of the TCC1 particularly Para's 14 to 27, and the attachment documents E and F to the TCC1 Report. As a result we have the following questions that we would like to put the WCPFC as part of the feasibility study.

Q1) Since their publication has there been any changes to the draft rules for the release and uses of VMS data (Attachment F), if not is it likely that there will be any changes to the rules or can we make the assumption that they will be the rules that the VMS will have to operate within?

Q2) Since their publication have there been any changes to the draft ALC Certification requirements(Attachment E); if not, is it likely that there will be any changes to the requirements or can we make the assumption that these will be the requirements for the ALC?

Q3) What's the minimum size of vessel that the VMS required to cover, the TCC1-13 document discusses in paragraph 58 gives an example of the VMS operating on vessels greater that 12 meters in length over all by the fourth year of operation, should that size be used as the minimum vessel size to be included in this study? A further clarification on this point: does the Commission wish to use length or GRT as a classification of size?

Q4) For the link between the VMS and the vessel registry: what details can you provide to us on the structure of the vessel registry? The type of thing that we find useful would be an entity relationship diagram of the registry, the details of the information it is expected to hold, the expected functionality of the registry, and the implementation plan.

Q5) Are there any outputs of the WCPFC corporate data model study of which we should be aware in order to fit the VMS within the CDM?.

Q6) In the draft rules for the release and use of VMS data (Attachment F) there are a couple of references to a secure web site. For example "The Commission shall place a list of vessels submitting VMS reports and messages on a password-protected section of the WCPFC website. The list shall be posted monthly by the Secretariat, establishing an electronic archive." Can you provided any details on the current web site? Is there is a secure area? How you would wish the VMS information to be placed on such a site?

Q7) In the literature we have seen the Western Central Pacific Ocean (WCPO) and the Commission Statistical Area (CSA) referred to, see fig below from SC1-ST-IP1 Estimates of annual catches in the WCPFC convention area report. Can you confirm which area the VMS is to cover, and are you able to give precise definition of the area,

especially on the western side? Also are there any sub areas that the Commission has identified or plans to use.

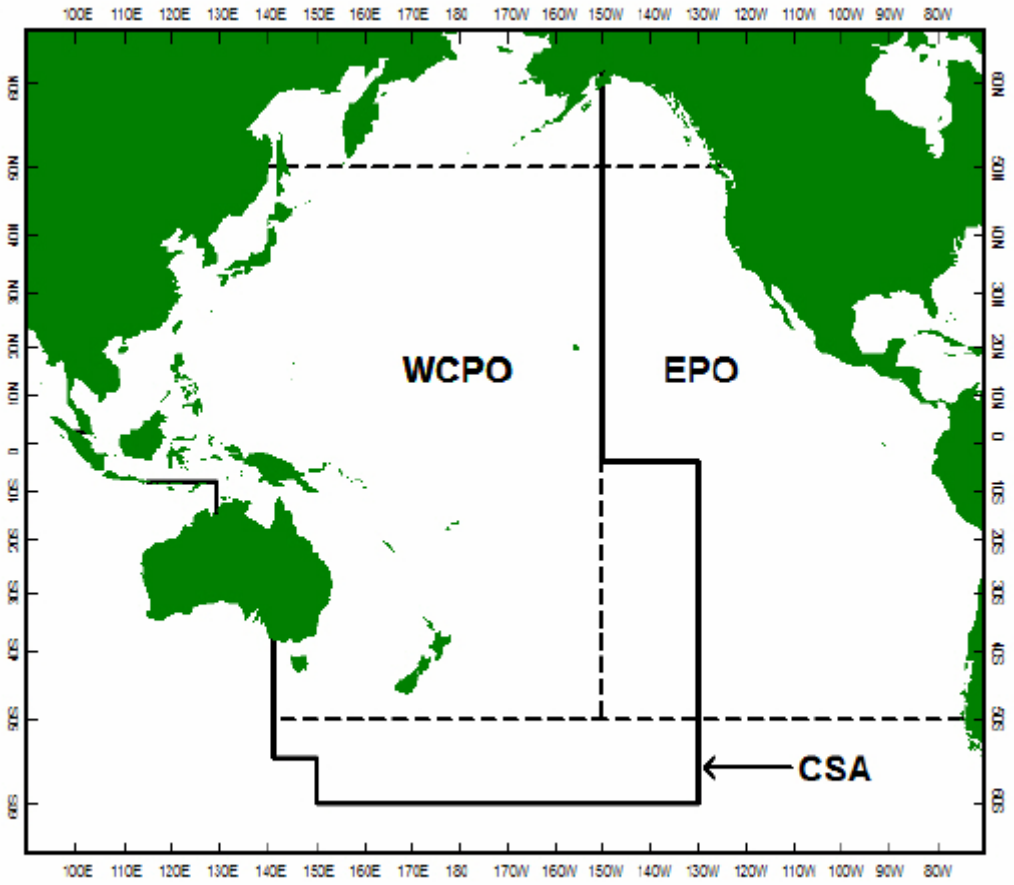

Figure 1. WCPFC Convention Statistical Area (CSA), the Western and Central Pacific Ocean (WCPO) Area and the Eastern Pacific Ocean (EPO) Area

Q8) Can you provide us with details of the fishing fleets in the WCPFC area and there activity, The kind of breakdown that we would like would be; the type of vessel by gear and size, the flag state, and the locations that they are operating in over time (we are also planning to contact Member States on this issue – through the Commission).

Q9) With a phased deployment likely, does the Commission have a preference for which fleet(s) should be covered by the first deployment of the VMS

Q10) Does the Commission have particular preferences when it comes to infrastructure that the VMS may use. Things that might be considered would be communications, Internet protocols, hardware and software. What limitations are there on infrastructure given the Commission's location; for example is what computer brands are available on Pohnpei and what maintenance support is available?

Attachment 2

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

Technical and Compliance Committee
First Regular Session

5–9 December
Pohnpei, Federated States of Micronesia

DRAFT

WCPFC MEMBERS' VESSEL MONITORING SYSTEM CERTIFICATION REQUIREMENTS FOR AUTOMATIC LOCATION COMMUNICATORS V1.0, 7 December 2005

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1. INTRODUCTION

1.1 GENERAL

The Western Central Pacific Fisheries Commission (WCPFC) is responsible for assisting its members with the management of fisheries and enforcement of fisheries law in the western and central Pacific Ocean. Access to timely and accurate vessel position information is vital to meeting these responsibilities.

The WCPFC Members' Vessel Monitoring System (WCPFC VMS) is a group of systems based and managed at Pohnpei that distributes vessel position data to Commission members where it is used for monitoring, surveillance and compliance purposes in accordance with agreed data sharing arrangements.

The WCPFC VMS is an important tool which WCPFC uses to monitor the positions of vessels.

The WCPFC VMS is based on the use of WCPFC approved Automatic Location Communicators (ALC) to be used on board vessels, and associated shore-based facilities and systems.

WCPFC type approval is used by the WCPFC and by other authorities such as the Australian Fisheries Management Authority to regulate the types of ALC available to vessel operators. By applying for type approval the manufacturer/supplier agrees to the documentation being released to other fisheries authorities using the WCPFC type approval process. However manufacturers should note that WCPFC type approval does not automatically mean that other authorities shall accept the unit as type approved. Since authorities other than WCPFC may have other requirements, the manufacturer should check with the relevant authority.

1.2 PURPOSE

This document describes the current requirements of electronic positioning and communications equipment for vessels required to utilize ALCs, so that authentic and

secure positioning information can be obtained from fishing vessels. These certification requirements will change and evolve over time. The WCPFC's type approval process will involve an assessment of an ALC against the requirements documented herein. See section 9 for a definition of the overall process.

1.3 PROSECUTION SUPPORT

Due to the use of VMS for law enforcement, all technical aspects of a supplier's submission are subject to being admitted as evidence in a court of law, if needed. The reliability of all technologies utilized in the ALC may be analyzed in court for, *inter alia*, testing procedures, error rates, peer review, and general industry acceptance. Further, the supplier may be required to provide technical and expert support for a litigation to support the ALC capabilities to establish WCPFC's (or a WCPFC members') case against violators. If the technologies have previously been subject to such scrutiny in a court of law, the supplier should describe the evidence and any court finding on the reliability of the technology. Additionally, to maintain the integrity of VMS for fisheries management, the supplier will be required to sign a non-disclosure agreement limiting the release of certain information that might compromise the effectiveness of the VMS operations, such as details of anti-tampering safeguards. The supplier shall include a statement confirming its agreement with these conditions.

1.4 GUIDELINES TO REMAINING SECTIONS:

Section 2:	Defines the mandatory generic functional requirements that all ALCs must meet regardless of the satellite and communications technologies employed.
Section3:	Identifies optional requirements.

Certification Requirements for Automatic Location Communicators

Section 4a:	Identifies detailed specific requirements for ALCs using Inmarsat technologies
Section 4b:	Identifies detailed specific requirements for ALCs using Argos technologies
Section 5:	Defines formats of reports and messages that the ALC must comply with.
Section 6:	Defines the ALC Fitting Procedures
Section 7:	Defines Procedures to be followed when completing a Type Approval Assessment
Section 8:	Defines the Type Approval submission process
Section 9:	Defines the overall type approval process
Appendix A:	Defines the Functional questions for Type Approval
Appendix B:	Defines the specific questions for Inmarsat based ALCs.
Appendix C:	Defines the specific questions for Argos based ALCs.

1.5 NOUNS AND ABBREVIATIONS

The following nouns and abbreviations have been used throughout the rest of this document.

Acronym/Noun	Meaning
ALC	Automatic Location Communicator
CEP	Circular Error Probable
DNID	Data Network ID as used by Inmarsat-C service
WCPFC	Western Central Pacific Fisheries Commission
FSP	Forwarding Service Provider: the organization that provides land earth station or processing centre services to the FFA
GMDSS	Global Marine Distress and Safety Service
IMN	Inmarsat Mobile Number
GPS	Global Positioning System
LES	Land Earth Station
MEM	Macro-Encoded Message
MES	Mobile Earth station as used by Inmarsat-C service
NMEA	National Marine Electronics Association
SCADA system	A Supervisory Control and Data Acquisition System that manages the collation of information from sensors installed on board the vessel
SDM	Inmarsat Systems Definition Manual
TDM	Time Division Multiplex
Transmission medium	The transmission medium being utilized by the ALC to transmit data to the LES. The transmission medium is assumed to be operating within normal parameters for the purposes of this type approval.
Transceiver Box	Enclosure housing the Inmarsat-C transceiver and the GPS decoder
Transmitter Box	Enclosure housing the Argos transmitter and GPS decoder
VMS	Vessel Monitoring System: Refers to the total WCPFC system for monitoring vessel position of which the ALC is a part.
VMS Emulator	Software used by the organization carrying out Type Approval which emulates essential functions of the WCPFC system
DRMS	Distance Root Mean Squared
RMS	Root Mean Squared

1.6 Acceptance of Prior Approvals

Where an ALC has been type approved by another fisheries agency, the WCPFC may accept part or all of that approval towards the WCPFC type approval. However the ALC must meet the requirements detailed in this document. Regardless to prior type approval full documentation and an ALC must still be provided for WCPFC type approval.

2. MANDATORY GENERIC FUNCTIONAL BUSINESS REQUIREMENTS:

The following items identify the minimum set of mandatory requirements that must be supported by all Satellite Service Providers and the associated ALCs. These tests are implemented as ‘On-Line’ and ‘Off-Line’ as identified in Appendix A.

2.1 POSITION REPORTING:

2.1.1 AUTOMATED POSITION REPORTING:

The ALC must be capable of automatically transmitting position reports (including latitude and longitude), an ALC identifier and a time of position fix. In addition, it must not be reasonably possible for the reporting interval to be observed, or to otherwise visually determine when a position report is generated by the ALC.

2.1.2 COURSE AND SPEED:

It must be possible for the ALC to provide the vessel's actual course and speed at a moment in time, along with position reports.

2.2 POWER ON/OFF MESSAGES:

2.2.1 AUTOMATIC MESSAGE SENT ON POWER ON:

A "Power-On" message must be automatically sent to FFA by the ALC when it is turned on after having been powered off. It must be the first message sent, must be identifiable as a "Power-On" message, and must be accompanied by a position report.

2.2.2 MESSAGE AT POWER OFF:

A "Power-Off" message must be sent when the ALC is deliberately shut down by the operator via selecting an appropriate menu option. When the ALC is abruptly powered off without warning (e.g.: the plug is pulled or power has been otherwise lost) this event must be recognized at the next power-up (see 2.2.1 above) and an appropriate message sent accordingly.

2.3 COMPUTER INTERFACE:

2.3.1 The ALC must be capable of interfacing with a nearby computer system such that messages (such as catch messages) can be generated by a person using the computer. The messages generated must then be capable of being addressed and relayed to the WCPFC in 'near real time'.

2.5 IMMEDIATE POSITION REPORT:

2.5.1 The ALC must provide an immediate position report to the WCPFC (under normal operating conditions and without any human intervention on the vessel) within a maximum of 5 minutes of the time of request from the WCPFC under the normal operating conditions of the FSP, or position reports must be provided at a frequency of hourly or better.

2.6 SECURITY

The ALC:

2.6.1 ALCs must provide robust protection against willful attempts to compromise the physical security of the ALC or otherwise allow an ALC to be modified such that one ALC could be used to masquerade as another or to appear to be in a location that it is not.

2.6.2 ALCs must be provided with a unique ALC identifier or serial number stored in Non Volatile Read Only Memory that can be matched within the FFA ALC registration system to a related internal identifier transmitted by that ALC. To enable proper identification of the ALC, the internal ALC identifier must not be capable of being set or altered by any person other than the manufacturer or the manufacturer's authorized agent.

In addition the same unique ALC identifier must be attached or etched onto the outside casing of the ALC.

2.6.3 It must not be reasonably possible to monitor ALC transmissions other than from the satellite to which the transmissions are intended.

2.6.4 The system must detect when the ALC is disconnected or otherwise prevented from establishing communications with the communications satellite. In this situation, once communication is re-established, a message should be sent indicating that the ALC is now operational.

Between the ALC and the FSP:

2.6.5 Data transmitted from the ALC to the FSP must be provided in a secure manner which preserves the integrity and confidentiality of the data, and does not allow any of the information to be intercepted by third parties.

Between the FSP and WCPFC:

2.6.6 Data transmitted from the FSP to the WCPFC must be capable of being provided in a secure manner which preserves the integrity and confidentiality of the data and does not allow any of the information to be intercepted by third parties.

2.7 AUTOMATED POSITION REPORTS:

2.7.1 The frequency of positions received by the WCPFC as reported by the ALC must be able to be altered by the WCPFC in "near real time" or position reports must be provided at a frequency of hourly or better.

2.7.2 It must not be reasonably possible for anyone (other than the monitoring authority e.g.: WCPFC) to alter or disable the automated position reporting to that authority.

2.7.3 The minimum interval for the provision of position reports must be at least 10 minutes and the maximum interval at least 24 hours or, for those with fixed reporting intervals, a frequency of hourly or better.

2.7.4 Position data must be available to the WCPFC under normal operating conditions of the ALC and the FSP, within [10 minutes] of transmission from the ALC.

2.7.5 There must be no gaps in the coverage offered by the satellite technologies under normal operating conditions of the FSP employed during any normal 24 hour period.

2.8 ACCURACY OF POSITION REPORTS:

2.8.1 Under normal GPS operational conditions positions derived from the data forwarded must be accurate to within 100 metre² Distance Root Mean Squared (DRMS), i.e. 98 per cent of the positions must be within this range.

2.9 GLOBAL COVERAGE

2.9.1 The ALC type must offer Global coverage (with the exception of the polar regions) through the satellite service providers such that the WCPFC can accurately potentially plot positions of vessels all around the world.

2.10 ALCS ABLE TO SEND MESSAGES TO MORE THAN ONE CLIENT

The ALC and/or forwarding service hardware and forwarding service must be able to support the ability for position data to be sent concurrently to multiple independent clients such as: NZ MFish, Australian Fisheries Management Authority, the FFA, the vessel owner ...etc.

3.0 OPTIONAL FUNCTIONAL REQUIREMENTS:

The following items identify optional functional requirements that may be supported by the ALC:

3.1 ALCs able to interface to a SCADA system:

The ALC should be capable of interfacing to a Supervisory Control and Data Acquisition System that manages the collation of information from sensors installed on board the vessel. An interface to the ALC and associated computer software would provide for the provision of such data to a monitoring authority such as the WCPFC.

3.2 POWER SUPPLY WHEN IDLE:

The ALC must be capable of providing position reports from a single 100 amp-hour marine battery for up to 30 days. In this situation the vessel's generator will not be working and the vessel will not be using any shore-based power supply.

3.3 READ ONLY MEMORY VERSION:

The ALC should maintain the time and date of the last firmware download (i.e.: into ROM) so that unauthorized attempts to update the transceiver internal storage can be detected.

4.0a REQUIREMENTS FOR INMARSAT-BASED ALCS.

This section defines the requirements that ALCs based upon Inmarsat technologies must meet.

The requirements in this section are additional to those outlined in section 2 above.

4.1 SYSTEM DESCRIPTION

The Inmarsat ALC shall consist of an Inmarsat approved integrated GPS decoder and Inmarsat-C transceiver.

4.1.1 DETERMINING VESSEL POSITION

Vessel position shall be derived from a dedicated GPS decoder and antenna that receives signals from the GPS satellites.

4.1.2 POSITION REPORTING

Vessel position shall be reported via a certified Inmarsat-C transceiver.

4.1.2.1 Position Reporting at Preset Intervals

The system must be able to supply position information at preset intervals using unreserved access over the data reporting channel.

The system may be able to supply position information at preset intervals using reserved access over the data reporting channel.

The minimum range of reporting intervals shall be between 15 minutes and 24 hours with increments that conform to the Inmarsat SDM.

The format of the position report shall comply with the Position Report Format defined in section 5.2 of this document.

4.1.2.2 Position Reporting on Demand

The system must supply position information on demand (without human interaction at the ALC) using unreserved access over the data reporting channel.

The format of the position report shall comply with the Position Report Format defined in section 5.2 of this document.

The format for the polling command to demand a position report shall comply with the Polling Packet Format defined in section 3.3.2.1 of this document.

4.1.2.3 First Position Report

The ALC must automatically (without user instruction) send a "first" position report immediately after login using unreserved access over the data reporting channel. The format of the "first" position report must comply with the Position Report Format defined in section 5 of this document with the inclusion of Macro Encoded Message (MEM) 40 (hex) to indicate a first position report.

4.1.2.4 Last Position Report at Power-Up

The ALC must automatically (without user instruction) send a "Last Known" position report after login (i.e.: after having previously been powered down) using unreserved access over the data reporting channel. The format of the "Last Known" position report must comply with the Position Report Format defined in section 5 of this document with the inclusion of Macro Encoded Message (MEM) 42 (hex) to indicate a first position report.

4.1.2.5 Antenna Disconnected Position Report

The ALC must be capable of automatically (without user instruction) sending a "Antenna Disconnected" position report immediately after recovering the satellite TDM using unreserved access over the data reporting channel. The format of the "Antenna Disconnected" position report must comply with the Position Report Format defined in section 5 of this document with the inclusion of Macro Encoded Message (MEM) 44 (hex) to indicate a first position report.

4.1.2.6 Antenna Blocked Position Report

The ALC must be capable of automatically (without user instruction) sending a "Antenna Blocked" position report immediately after recovering the Satellite TDM using unreserved
access over the data reporting channel. The format of the "Antenna Blocked" position report must comply with the Position Report Format defined in section 5 of this document with the inclusion of Macro Encoded Message (MEM) 45 (hex) to indicate a first position report.

4.1.3 REMOTE COMMANDS

The ALC must be able to accept polling commands to alter the frequency of position reporting and to supply position information on demand using unreserved access over the data reporting channel.

The format for the polling command to supply position on demand using unreserved access shall comply with the Polling Packet Format defined in section 5 of this document.

The command format to change reporting frequency using unreserved access shall comply with Polling Packet Formats defined in section 5 of this document.

The ALC should be able to accept polling commands to alter the frequency of position reporting using reserved access over the data reporting channel.

The command format to change reporting frequency using reserved access should comply with Polling Packet Formats defined in sections 5 of this document.

4.1.4 REPORTING

The ALC shall be able to communicate reports to the FFA over the standard store and forward message channel.

4.2 PHYSICAL REQUIREMENTS OF ALC

4.2.1 GENERAL

The ALC shall consist of three main units as described below.

1. A single common antenna shall be used for both GPS and Inmarsat-C functions.
2. The GPS decoder and the Inmarsat-C transceiver shall be housed in the same physical enclosure. The enclosure will hereafter be referred to as the Transceiver Box. The Transceiver Box shall be connected using a single length of unbroken cable to the single common antenna. Note: the GPS decoder, transceiver and the common antennae can be housed in the same physical enclosure.
3. As a minimum, the Inmarsat-C transceiver shall be highly integrated so that the link between the Inmarsat-C transceiver and the GPS module may not be accessed in any unauthorized manner that could result in a compromise to the integrity of GPS position reports. The party seeking type approval must provide sufficient proof of the security of the link between the GPS decoder and the Inmarsat transceiver.
4. A user terminal shall be required for the entry of other information such as catch reports. This shall either be a dedicated integrated terminal or an external computer. The user terminal may be supplied by the supplier of the ALC.

In addition to the above, the system may have a printer and other navigational equipment attached to it.

4.2.2 ELECTRICAL INTERFACE REQUIREMENTS

The Transceiver Box shall have an interface to which the user terminal can be connected if they are separate. If the terminal is a personal computer then an RS-232C interface may be provided.

The Transceiver Box may have an NMEA 0183 interface to allow connection of other navigational equipment to it.

4.2.3 OPERATING TEMPERATURES

The ALC, excluding the user terminal, shall be able to function at specified accuracy between -20 degrees Celsius and +50 degrees Celsius.

4.2.4 MARINE USE

All units of the system shall be designed for marine use - that is, components that are exposed to the elements in the normal course of operation shall be suitably rated (IP66 or equivalent) to ensure reliable continuous operation. Components that are housed below decks in the normal course of operation shall be suitably rated to ensure suitable reliable continuous operation.

4.2.5 PHYSICAL MOUNTING REQUIREMENTS

All units in the system shall be provided with suitable mounting instructions and fittings for marine use. Such fixings shall be capable of securing the device to prevent movement when exposed to the vibration and shaking typically experienced aboard a deep sea going vessel, so as to ensure continued reliable operation as required by the VMS.

Detailed requirements for mounting equipment are specified in section 6.

4.3 GPS DECODER

4.3.1 POSITION ACCURACY ERROR

Position error with selective availability turned on must be less than +/- 18m RMS.

Position error with selective availability turned off must be less than +/- 18 m RMS.

4.3.2 VELOCITY ERROR

Velocity error must be less than 0.4 knots Root Mean Squared (RMS).

4.3.3 ACQUISITION LOCK TIMES

The acquisition lock times of the GPS must be less than the following.

From a cold start:(i.e.: has a current Almanac and has been turned off for between 1hr and 10 days)	5 minutes
From a warm start:(i.e.: has been turned off for less than 1 hr)	2 minutes
From losing lock:	1 minute

4.3.4 UPDATE RATE

Update rate shall be better than once every 15 seconds (providing sufficient satellites are in view to obtain a position).

4.4 INMARSAT-C TRANSCEIVER

4.4.1 TYPE APPROVAL

The transceiver shall be type approved by Inmarsat for Inmarsat-C Class II operation.

The transceiver may be type approved by Inmarsat for Inmarsat-C Class III operation.

Inmarsat-C Class II operation: A Class 2 MES is capable of two modes of operation (selected by the operator): As Class 1, and also capable of receiving EGC messages when not engaged in Inmarsat C traffic. Ready for EGC message reception exclusively (and not available in that mode for Inmarsat C message transfer).

Inmarsat-C Class III operation: A Class 3 MES has two independent receivers, one for receiving two-way Inmarsat C messages, the other for receiving EGC messages.

4.4.2 COMMUNICATION CHANNELS

The Inmarsat-C transceiver shall support the sending and receiving of messages via the standard store and forward message channel.

The Inmarsat-C transceiver shall support the sending and receiving of reports via the data reporting channel.

4.5 USER INTERFACE TERMINAL

4.5.1 GENERAL

The user terminal shall either be a specifically designed terminal for use with the Transceiver Box, or a personal computer if a suitable interface is available.

4.5.2 MARINE USE

The user terminal must be capable of use, for prolonged periods, in a below deck marine environment so as to ensure continued reliable operation of the VMS. The user terminal must be sufficiently protected against exterior marine weather environments.

4.5.3 TERMINAL SOFTWARE

The terminal must be accompanied by software that allows the system to carry out the functions listed in section 4.1.4 of this document. Details of the message formats that the software supports must be supplied.

4.5.3.1 Unauthorised Areas of Access

The user interface shall not allow user access to functions that can alter or disable any functions relating to position reporting as described in sections 4.1.2 and 4.1.3 of this document.

4.5.3.2 Programming of DNIDs

The ALC shall only be able to accept DNIDs via the download and initiation poll commands sent by the associated LES.

The ALC shall only be able to delete DNIDs via the delete poll command sent by the associated LES.

4.5.3.3 Reading of Forward and Reverse Identifiers

Other than for the normal operating processes within the ALC, the Forward and Reverse Identifiers held within the ALC shall not be able to be determined by reading a storage area that contains this information, or by observing its transfer on the data bus.

4.6 SERVICING

Any features built into the ALC or terminal software to assist with servicing shall not allow unauthorised access to any areas of the ALC that could potentially compromise the operation of the VMS.

If the ALC component containing the Forward and Reverse Identifiers requires replacement then the supplier shall:

1. Contact WCPFC and request that the original IMN is deregistered.

2. Commission the ALC with the new hardware and IMN.

3. Contact WCPFC and register the "new" ALC with the vessel affected.

4.0b REQUIREMENTS FOR ARGOS-BASED ALCS.

This section defines the requirements that ALCs based upon Argos technologies must meet.

The requirements in this section are additional to those outlined in section 2 above.

4.1b SYSTEM DESCRIPTION

The Argos ALC shall consist of an Argos approved integrated GPS decoder and Argos transmitter.

4.1.1b DETERMINING VESSEL POSITION

Vessel position shall be derived from a dedicated GPS decoder and antenna that receives signals from the GPS satellites.

4.1.2b POSITION REPORTING

Vessel position shall be reported via a certified Argos transmitter.

4.1.2.1b Position Reporting at Preset Intervals

The system must be able to supply position information at preset intervals.

The format of the position reports shall comply with the standard Argos position reporting formats.

4.1.2.2b [not applicable to Argos - deleted]

4.1.2.3b [not applicable to Argos - deleted]

4.1.2.4b [not applicable to Argos -deleted]

4.1.2.5b [not applicable to Argos - deleted]

4.1.2.6b ~~Antenna Blocked Position Report~~ ALC Malfunction

The system must be capable of providing technical information on probable causes of ALC failure including antenna blockages and forwarding a message to the WCPFC.

4.1.3b [not applicable to Argos – deleted]

4.1.4b [deleted]

4.2b PHYSICAL REQUIREMENTS OF ALC

4.2.1b GENERAL

The ALC shall consist of three main units as described below.

1. [deleted]
2. The GPS decoder and the Argos antenna and transmitter shall be housed in the same physical enclosure. The enclosure will hereafter be referred to as the Transmitter Box.
3. As a minimum, the Argos transmitter shall be highly integrated so that the link between the Argos transmitter and the GPS module may not be accessed in any unauthorized manner that could result in a compromise to the integrity of GPS position reports. The party seeking type approval must provide sufficient proof of the security of the link between the GPS decoder and the Argos transmitter.
4. A user terminal shall be required for the entry of other information such as catch reports. This shall either be a dedicated integrated terminal or an external computer. The user terminal may be supplied by the supplier of the ALC.

4.2.2b ELECTRICAL INTERFACE REQUIREMENTS

The Transmitter Box may have an interface to which the user terminal can be connected if they are separate. If the terminal is a personal computer then an RS-232C interface may be provided.

4.2.3b OPERATING TEMPERATURES

The ALC, excluding the user terminal, shall be able to function at specified accuracy between -40 degrees Celsius and +50 degrees Celsius.

4.2.4b MARINE USE

All units of the system shall be designed for marine use - that is, components that are exposed to the elements in the normal course of operation shall be suitably rated (IP66 or equivalent) to ensure reliable continuous operation. Components that are housed below decks in the normal course of operation shall be suitably rated to ensure suitable reliable continuous operation.

4.2.5b PHYSICAL MOUNTING REQUIREMENTS

All units in the system shall be provided with suitable mounting instructions and fittings for marine use. Such fixings shall be capable of securing the device to prevent movement when exposed to the vibration and shaking typically experienced aboard a deep sea going vessel, so as to ensure continued reliable operation as required by the VMS.

Detailed requirements for mounting equipment are specified in section 6.

4.3b GPS DECODER

4.3.1b POSITION ACCURACY ERROR

Position error with selective availability turned on must be less than +/- 18m RMS.

Position error with selective availability turned off must be less than +/- 18 m RMS.

4.3.2b VELOCITY ERROR

Velocity error must be less than 0.4 knots Root Mean Squared (RMS).

4.3.3b ACQUISITION LOCK TIMES

The acquisition lock times of the GPS must be less than the following.

From a cold start:(i.e.: has a current Almanac and has been turned off for between 1hr and 10 days)	5 minutes
From a warm start:(i.e.: has been turned off for less than 1 hr)	2 minutes
From losing lock:	1 minute

4.3.4b UPDATE RATE

Update rate shall be better than once every 15 seconds (providing sufficient satellites are in view to obtain a position).

4.4b ARGOS TRANSMITTER

4.4.1b TYPE APPROVAL

The transmitter shall be type approved by Argos for use with the Argos system.

4.5b USER INTERFACE TERMINAL

4.5.1b GENERAL

The user terminal shall either be a specifically designed terminal for use with the Transmitter Box, or a personal computer if a suitable interface is available.

4.5.2b MARINE USE

The user terminal must be capable of use, for prolonged periods, in a below deck marine environment so as to ensure continued reliable operation of the VMS. The user terminal must be sufficiently protected against exterior marine weather environments.

4.5.3b [not applicable to Argos - deleted]

4.5.3.1b Unauthorized Areas of Access

The user interface shall not allow user access to functions that can alter or disable any functions relating to position reporting as described in sections 4.1.2 and 4.1.3 of this document.

4.5.3.2b [not applicable to Argos - deleted]

4.5.3.3b [not applicable to Argos - deleted]

4.6b SERVICING

Any features built into the ALC or terminal software to assist with servicing shall not allow unauthorized access to any areas of the ALC that could potentially compromise the operation of the VMS.

If the ALC component needs to be replaced, the supplier shall:

1. Contact WCPFC and request that the original Identification Number is deregistered.

2. Commission the ALC with the new hardware and Identification Number.

3. Contact WCPFC and register the "new" ALC with the vessel affected.

5. INMARSAT-C MESSAGE FORMAT SPECIFICATION

5.1 GENERAL

This section of the document defines formats of messages, position reports and polling commands to which the Inmarsat based ALC must comply.

The following subsections refer to sections of the Inmarsat-C System Definition Manual, Release 2.0, September 1992 (incorporating CN100) or its subsequent editions. The System Definition Manual will hereafter be referred to as the SDM. The ALC manufacturers must provide details of the communications services as part of the type approval process.

5.2 FORMAT OF POSITION REPORTS

The format of the position report to be sent over the data reporting channel, using reserved access, shall comply with the Maritime Position Report for reserved access defined in the SDM.

The format of the position report to be sent over the data reporting channel, using unreserved access, shall comply with the Maritime Position Report for unreserved access defined in the SDM.

Note: That whenever a position report is sent, the attribute field should contain time-of-fix, MEM 0B (hex).

5.3 FORMAT OF POLLING COMMANDS FOR INMARSAT-C REMOTE PROGRAMMING

5.3.1 POLLING COMMANDS

5.3.1.1 Polling Command to Define a Macro-Encoded Message

The ALC may implement a polling command to implement Macro-Encoded Messages. If the ALC does implement polling commands for MEMs, then the format of the polling packet to remotely define a MEM shall comply with the polling packet format defined for command type 08H, as defined in the SDM.

5.3.1.2 Polling Command for Data Transmission

The ALC may implement a polling command to implement data transmission Messages. If the ALC does implement polling commands for data transmission, then the format of the polling packet for data transmission shall comply with the polling packet format defined for command type 09H, as defined in the SDM.

5.3.1.3 Polling Command to Download DNID

The ALC may implement a polling command from the associated LES to implement Download DNID. If the ALC does implement polling commands for Download DNID, then the format of the polling packet to remotely download a DNID to an MES shall

comply with the polling packet format defined for command type 0AH, as defined in the SDM.

5.3.1.4 Polling Command to Delete DNID

The ALC may implement a polling command to implement Delete DNID.

If the ALC does implement polling commands for Delete DNID, then the format of the polling packet to remotely delete a DNID from an MES shall comply with the polling packet format defined for command type 0BH, as defined in the SDM.

5.3.2 FORMATS OF POLLING COMMANDS TO PROGRAM UNRESERVED DATA REPORTING

5.3.2.1 Polling Packet Format to Demand Position Report

The ALC may implement a polling command to implement Demand Position Report. If the ALC does implement polling commands for Demand Position Report, then the format of the polling packet to send back an unreserved position report on demand shall comply with the polling packet format defined for command type 00H, for sending an unreserved report.

5.3.2.2 Polling Packet Format to Remotely Program Reporting Interval

The ALC may implement a polling command to implement Remotely Program Reporting Interval. If the ALC does implement polling commands for Remotely Program Reporting Interval, then the format of the polling packet to remotely program the unreserved position reporting interval shall comply with the polling packet format defined for command type 04H as defined in the SDM.

5.3.2.3 Polling Packet Format to Initiate Position Reporting

The ALC may implement a polling command to implement Initiate Position Reporting. If the ALC does implement polling commands for Initiate Position Reporting, then the format of the polling packet to initiate unreserved position reporting shall comply with the polling packet format defined for command type 05H as defined in the SDM.

5.3.2.4 Polling Packet Format to Stop Position Reporting

The ALC may implement a polling command to implement Stop Position Reporting. If the ALC does implement polling commands for Stop Position Reporting, then the format of the polling packet to stop unreserved position reporting shall comply with the polling packet format defined for command type 06H as defined in the SDM.

5.3.3 FORMATS OF POLLING COMMANDS TO PROGRAM RESERVED DATA REPORTING

5.3.3.1 Polling Packet Format to Remotely Program Reporting Interval

The ALC may implement a polling command to implement Remotely Program Reporting Interval. If the ALC does implement polling commands for Remotely Program Reporting Interval, then the format of the polling packet to remotely program reserved position reporting shall comply with the polling packet format defined for command type 01H as defined in the SDM.

5.3.3.2 Polling Packet Format to Initiate Position Reporting

The ALC may implement a polling command to implement Initiate Position Reporting. If the ALC does implement polling commands for MEMs, then the format of the polling packet to initiate reserved position reporting shall comply with the polling packet format defined for command type 02H as defined in the SDM.

5.3.3.3 Polling Packet Format to Stop Position Reporting

The ALC may implement a polling command to implement Stop Position Reporting. If the ALC does implement polling commands for MEMs, then the format of the polling packet to stop reserved position reporting shall comply with the polling packet format defined for command type 03H as defined in the SDM.

6. FITTING PROCEDURES

Note: most authorities have separate installation guidelines, however, these guidelines are included here as part of the type approval process to ensure that the ALC can meet these requirements.

6.1 GENERAL

This section of the document defines minimum standards for the installation of all components of the ALC.

Installation shall be carried out by either the ALC supplier, a WCPFC approved Agentor an agent approved by the ALC supplier.

The vessel operator shall ensure that all components of the ALC are installed in a manner that provides continuous reliable operation of the ALC as a part of the VMS.

The following subsections provide more detailed instructions for the installation of the main components of the ALC.

6.2 THE TRANSCEIVER/TRANSMITTER BOX

6.2.1 MOUNTING

The Transceiver/Transmitter Box shall be installed, commissioned and maintained in accordance with the manufacturer's instructions in such a way as to ensure correct operation. Fixings used shall be capable of securing the device to prevent movement when exposed to the vibration and shaking typically experienced aboard a deep sea going vessel so as to ensure continuous reliable operation of the ALC as a part of the VMS.

The vessel operator shall ensure that the Transceiver/Transmitter Box is at all times installed in a manner that provides continuous reliable operation of the ALC as a part of the VMS.

6.3 THE ANTENNA

6.3.1 MOUNTING

The antenna, where applicable, shall be installed, commissioned and maintained in accordance with the manufacturer’s instructions and in such a manner as to ensure

correct operation. Fixings used shall be capable of securing the device to prevent movement when exposed to the vibration and shaking typically experienced aboard a sea going vessel so as to ensure continuous reliable operation of the ALC as a part of the VMS.

The antenna shall not have any other structures obstructing its view of either the GPS or Inmarsat satellites in such a manner as to degrade performance.

Certification Requirements for Automatic Location Communicators

The antenna shall be mounted in a position which shall meet manufacturer's recommendations of minimum distances from any HF antenna, VHF or Satellite Navigator antenna or magnetic compass.

In addition the antenna shall be mounted in a position where no humans will come within such a distance from it whereby they are exposed to dangerous levels of electromagnetic radiation while performing normal ship activities.

The vessel operator shall ensure that the antenna is at all times installed in a manner that provides continuous reliable operation of the ALC as a part of the VMS.

6.3.2 THE ANTENNA CABLE

The Antenna Cable, where applicable, refers to the single cable used to connect the antenna to the Transceiver Box.

The antenna cable used shall be supplied and/or specified by the manufacturer. The maximum cable length, as specified by the manufacturer, shall not be exceeded.

The antenna cable shall be installed in position where it will not be damaged by normal ship activity. This may involve enclosing the cable in a protective conduit.

All grounding requirements of the antenna, as specified by the manufacturer, shall be followed.

All connections between the cable, the antenna and the transceiver shall be made water-proof if the connection is to be exposed to the external environment. Connectors used shall be designed for use in a marine environment.

The vessel operator shall ensure that the antenna cable is at all times installed in a manner that provides continuous reliable operation of the ALC as a part of the VMS.

6.4 THE POWER SUPPLY

The power supply shall be capable of delivering the required power during transmission without degradation of performance of the ALC. The power supply shall be sufficiently stable and noise free to allow error free ALC operation.

If the power supply is supplied by the supplier of the ALC, it shall be mounted following instructions provided by the supplier. Fixings used shall be capable of securing the device to prevent movement when exposed to the vibration and shaking typically experienced aboard a deep sea going vessel.

Grounding requirements, as specified by the manufacturer of the power supply, must be followed.

The vessel operator shall ensure that the power supply meets the above requirements in a manner that provides continuous reliable operation of the ALC as a part of the VMS.

7. TESTING PROCEDURES

7.1 GENERAL

This section of the document outlines the procedures to be used when testing ALCs for type approval.

The application for Type Approval shall be made to the WCPFC following the application procedures outlined in section 8.

The WCPFC shall test the compliance of the ALC against the specification outlined in section 2 and 3 (appendix A) of this document, using either On-Line or Off-Line tests at the WCPFC's discretion. If the ALC does not pass the Functional tests outlined in section 2, the type approval process must stop, as detailed in section 9.1.

If an ALC does pass the tests outlined in section 2, then and only then:

- If the ALC is an Inmarsat type, the Type Approval Agent shall then test the compliance of the ALC against the specification outlined in section 4;
- If the ALC is not an Inmarsat type, the Type Approval Agent shall, in consultation with the WCPFC and the applicant, develop an equivalent series of tests to those identified in section 4.

Two main categories of tests shall be carried out to gain Type Approval. These are:

1. Off-Line Tests
2. On-Line Tests.

7.2 OFF-LINE TESTS

Off-line tests shall involve physical inspection of equipment and documentation supplied to assess compliance against specifications. All off-line tests must be completed and passed before any on-line testing is performed.

Off-line tests shall be carried out by answering all the questions presented in the relevant sections of Appendices A, B and C. Each question shall be considered a complete test on its own. Answers shall be obtained by thorough examination of the hardware, software and documentation supplied.

Unless otherwise noted, all questions relate to mandatory requirements and must therefore be passed for compliance. A question shall be passed if its answer is the same as the correct answer indicated on the question form in the Appendix.

7.3 ON-LINE TESTS FOR INMARSAT-C UNITS

7.3.1 GENERAL

On-line tests will only be carried out if all mandatory off-line tests are passed. On-line tests involve installing the commissioned ALC as a part of a system that is either identical to, or emulates the essential features of the WCPFC VMS. This system will hereafter be known as the VMS emulator.

The tests outlined in the following subsections shall be carried out to ascertain whether all the requirements of the WCPFC VMS are met. The tests relate to mandatory requirements and must therefore all be passed for the ALC to gain Type Approval.

On-line tests shall be carried out by following the process outlined in this section and by answering all the questions presented in Appendices B and C.

7.3.2 DOWNLOADING OF DNID CONFIGURATION DATA

The VMS emulator shall download the DNID configuration data to the ALC under test. Correct reception and interpretation of this data will be verified to confirm that the ALC can communicate with the VMS.

7.3.3 IMMEDIATE POLLED POSITION REPORTING

The VMS emulator shall be used to poll the ALC to supply its position. Correct reception of position data will confirm the following:

Polling Command Format:	The polling command format is as required if the position data is received correctly on the VMS emulator.
Position Report Format:	The position report format is as required if the position data is received correctly on the VMS emulator.

This test shall be carried out at least four (4) times to confirm the above.

7.3.4 REMOTE PROGRAMMING OF SCHEDULED POSITION REPORTING

The VMS emulator will be used to remotely program a reporting interval of 15 minutes on the ALC. Four position reports will then be observed. If the position data is received correctly on all four occasions then the test confirms that the ALC can send position reports via the data reporting channel at specified intervals.

The VMS emulator shall then be used to remotely change the reporting time to 30 minutes. Four position reports will be observed. If the position reports were received as expected then the test confirms that reporting intervals on the ALC can be programmed remotely.

7.3.5 FIRST POSITION REPORT

The VMS emulator will be used to verify that a first position report is sent after the ALC logs in. If the position data is received correctly with MEM 40 (hex) indicating a first position report then the test confirms automatic sending of first position reports upon login. Note that this test requires the ALC to be power cycled after the DNID is downloaded to it.

7.3.6 STOP POLL

The VMS emulator will be used to verify that a stop poll command is received and actioned by the ALC.

7.3.7 TIME-OF-FIX MEM

The VMS emulator will be used to verify that a time-of-fix report is sent after the ALC logs in, and whenever a position report is sent. If the data is received correctly with MEM 0B (hex) indicating a time-of-fix report, then the test confirms automatic sending of time-of-fix reports.

7.3.8 SUPPLY OF A REPORT OVER THE MESSAGE CHANNEL

The ALC will be used to prepare and send messages to the VMS emulator. If four reports are received without error then the test confirms that the ALC is able to send the required reports correctly.

7.3.9 TESTING FOR AN EXTENDED PERIOD

Once fully operational and programmed for automatic position reporting, the ALC is to left switched on for at least 14 days. During this period , the reliability of the continuous operation of the ALC is to be observed with any problems noted and investigated. During this period, the ALC may be polled from time to time to simulate actual operating conditions.

8. SUBMISSION FOR TYPE APPROVAL

8.1 GENERAL

This section of the document outlines the procedures involved in applying for type approval.

All equipment to be used on-board vessels for the purpose of position reporting must be type approved. Approval may be sought by anyone including the manufacturer, the distributor and the fishing company.

8.2 MULTIPLE SUPPLIERS OF THE SAME EQUIPMENT

If there is more than one supplier for exactly the same equipment and configuration of equipment, then each supplier does not have to apply for type approval.

8.3 APPLICATION REQUIREMENTS

The application for Type Approval shall be made to the WCPFC Compliance Manager.

The application shall include the following:

8.3.1 APPLICATION FORM

If required by the WCPFC organization, an application form, obtainable from the WCPFC, shall be completed and form a part of the application for type approval.

8.3.2 APPLICATION FEES

The application shall be accompanied by the relevant application fees.

Details of fees due for type approval are available from the organization carrying out the type approval service.

8.3.3 AUTOMATIC LOCATION COMMUNICATOR

A commissioned unit, identical in all respects to those to be supplied commercially, must be provided for testing to the WCPFC Compliance Manager. In addition to the commissioned unit, any additional equipment or software that is required for the proper operation of the ALC, must also be provided.

8.3.4 ALC SPECIFICATIONS

Technical specifications relating to the supplied equipment, in excess of operating manuals, must be supplied to the WCPFC Testing Agent to assist with type approval and will be retained. This extra information will include information relating to security provisions and information of the sort normally supplied to ALC installers.

8.3.5 OPERATIONAL RECOMMENDATIONS

Any instructions that will be supplied to buyers (manufacturer's operational recommendations) must be supplied to the WCPFC Testing Agent to assist with type approval.

8.3.6 SOFTWARE

Any software that will accompany the ALC when it is supplied commercially must be provided to the WCPFC testing agent to assist with type approval and will also be retained.

The type approval shall only apply to the version of software provided to the WCPFC Testing Agent. Revisions and updates to the software shall require certification by the manufacturer that the newer version of the software does not compromise the normal operation of the ALC when measured against the WCPFC requirements. The manufacturer shall provide full information on the newer software and detail the reasons for the changes. The newer software will not be permitted to be used until WCPFC had granted approval. The WCPFC reserves the right to require a full type approval process for new software.

8.3.7 INSTALLATION REQUIREMENTS

Any special installation requirements that are to be met in order for the ALC to comply with this document must be supplied in writing to the WCPFC Testing Agent to assist with type approval.

8.3.8 DESCRIPTION OF MESSAGE FORMATS

A description of message formats, suitable to ascertain whether the message formats outlined in section 4 have been followed, shall be included as a part of the application in order to assist with type approval.

8.3.9 DESCRIPTION OF GPS/INMARSAT OR ARGOS LINK

A technical description of the link between the GPS and Inmarsat or Argos units must be supplied to the WCPFC Testing Agent to assist with type approval, in the form of a formal declaration on letterhead, signed by a senior executive. The WCPFC may exempt the applicant from this requirement if the system is very tightly integrated.

8.3.10 DESCRIPTION OF MODIFICATIONS AFTER MANUFACTURE

A description of all modifications that have been or will be made to the equipment after manufacture and prior to actual use on the vessel shall be supplied to the WCPFC Testing Agent to assist with type approval. Minor modifications may be approved by WCPFC without a type approval process, by way of an examination of the technical specifications

of the modification. However the WCPFC may require type approval of any or all modifications.

8.3.11 EQUIPMENT CONFIGURATION

A description of any special configuration required to provide continuous reliable operation of the ALC as a part of the VMS shall be provided to the WCPFC Testing Agent to assist with type approval.

9.0 TYPE APPROVAL PROCESS

Type Approval shall be at the discretion of the Executive Director of the WCPFC, who may make such approvals subject to any such conditions and restrictions as he or she sees fit.

The type approval process shall be carried out as follows:

9.1 PHASE 1:

Upon receipt of all items outlined in section 8.3, the WCPFC Testing Agent shall carry out the first phase of the type approval assessment following the procedures outlined in section 7.

The FFA Testing Agent may request additional information from the applicant, and may enter into discussions with the applicant regarding how their ALC compares with the requirements set out in this document.

If the result of the first type approval phase is that the WCPFC is not satisfied that a particular ALC meets the requirements of the first phase of type approval, then:

- the assessment procedure shall cease
- the result of the type approval and the reasons for declining approval shall be communicated to the applicant
- the WCPFC Testing Agent shall return the equipment

9.2 PHASE 2:

The WCPFC shall consider all reasonable and relevant factors when determining if a particular ALC is to be accorded Type Approval.

Other reasonable and relevant factors that the WCPFC must consider, will include, but are not limited to:

1. the reliability of ALCs

2. contractual arrangements with the FSP

The results of the type approval process shall then be communicated by the WCPFC to the applicant and the public using a process to be defined by the WCPFC.

If the result of the type approval is that the WCPFC is not satisfied that a particular ALC meets the requirements, this shall be communicated to the applicant. The applicant should contact the FFA directly concerning reasons for the declined approval and the return of equipment.

APPENDIX A: FUNCTIONAL QUESTIONS FOR TYPE APPROVAL ON-LINE AND OFF-LINE TESTING

The following tables consist of questions that must be answered as a part of the functional assessment. Unless otherwise noted the questions all relate to mandatory requirements.

1. Mandatory Requirements - Off line Tests

Question	Answer	Pass Y/N
Actual		Correct
Does the ALC provide robust protection against willful tampering such that the operation or identity of the ALC could be compromised?		Y
Is the ALCs unique internal identifier stored in Non-Volatile ROM?		Y
Does the ALC have a clearly identifiable external unique factory assigned serial number permanently attached to the casing?		Y
Is the ALC capable of detecting when the antenna is dis-connected or blocked?		Y
Is the transmission of data from the ALC to the FSP provided in a secure manner?		Y
Is the transmission of data from the FSP to the Monitoring Authority (e.g.: the FFA) provided in a secure manner?		Y
Is it reasonably impossible to monitor ALC transmissions from other than the satellite to which the transmissions are intended?		Y
Are there any gaps in the coverage offered by the Global Positioning Satellite (GPS) technologies employed, in any normal 24 hour period?		N
Are positions derived by the ALC accurate to within $100M^2$ DRMS?		Y
Does the satellite technology employed offer global coverage (other than the polar regions)?		Y

2. Functional Mandatory Requirements - On-Line Tests

Question	Answer	Pass Y/N
Actual		Correct
Does the ALC automatically provide position reports, an authenticated ALC identifier and time of position fix?		Y

When required to do so, can the ALC automatically provide actual heading and speed along with the position reports?	Y
Does the ALC automatically provide an identifiable power-on message when turned on that contains a position report?	Y
Does the ALC automatically provide an identifiable power-off message when deliberately turned off via a menu option? Does the ALC recognize an abrupt power off when next turned on and provide a message indicating this has happened?	Y Y
Can the ALC interface with a computer system, such that ad-hoc or pre-formatted messages can be generated?	Y
Does the ALC provide two-way messaging, such that messages can be sent or received within 15 minutes under normal operating conditions?	Y
Does the ALC automatically normally respond to an immediate position report request, within a maximum of 5 minutes?	Y
Is the internal ALC identifier reasonably able to be altered by other than manufacturing factory or authorized servicing agent?	N
Does the ALC automatically detect if the antenna is incapable of establishing communications? In this situation, does the position report distinguish between a disconnected and blocked antenna?	Y Y
Can the position reports frequency be altered remotely in near real time?	Y
Is it possible to observe the moment when the ALC reports its position?	N
Is it reasonably possible for anyone other than the monitoring authority to alter or disable the automated position reporting?	N
Is the minimum interval for the provision of automated position reports 15 minutes or less and the maximum at least 24 hours?	Y
Is it possible to remotely alter the position reporting frequency of the ALC in near real time?	Y
Does the ALC automatically provide position data under normal operating conditions, within 10 minutes of transmission?	Y

APPENDIX B: QUESTIONS FOR INMARSAT TYPE APPROVAL: ON AND OFF-LINE

The following tables consist of questions that must be answered as a part of on and off-line testing for those ALC utilizing Inmarsat technologies. Unless otherwise noted the questions all relate to mandatory requirements. Exceptions from this are indicated in the Pass column using the following codes.

RC: Recommended Compliance
GC: Guideline Compliance

On and Off-Line testing are described in sections 7.2 and 7.3 of the main report. The questions relate to the requirements outlined in sections 4 and 5 of the main report.

1. SYSTEM DESCRIPTION - Off-Line Tests

Question	Answer	Pass Y/N
Actual		Correct
Can the system supply position reports in response to polling commands using unreserved access over the data reporting channel? Y/N		Y
Can the system report positions at preset intervals using unreserved access over the data reporting channel? (Y/N)		Y
Can the reporting frequency be remotely changed for position reporting using unreserved access over the data reporting channel? (Y/N)		Y
Does the ALC automatically send a "first" position report using unreserved access over the data reporting channel upon login to the Inmarsat network? (Y/N) Is MEM 40 used to indicate a first position report? (Y/N) Is MEM 42 sent on power up, and used to indicate a position immediately prior to a power down? (Y/N)		Y Y Y
Can the system report positions at preset intervals using reserved access over the data reporting channel? (Y/N)	Y	RC
Can the position reporting frequency be remotely changed by using reserved access over the data reporting channel? (Y/N)	Y	RC
Does the GPS system automatically overwrite any manual position entries? (Y/N)		Y
Is system security preserved as required by sections 4.5.3.1, 4.5.3.2 and 4.5.3.3 of this document? (Y/N)		Y
Are there any special features built into the ALC or the terminal software that could allow access to areas of the ALC that could compromise the operation of the VMS? (Y/N)		N

2. PHYSICAL SPECIFICATIONS - Off-Line Tests

Question	Answer	Pass Y/N
Actual	Correct	
Are the GPS and Inmarsat-C modules enclosed in the same housing? (Y/N)		Y
Are the Inmarsat-C transceiver and the GPS decoder highly integrated in a manner which ensures security of the GPS/Inmarsat Link? Has sufficient proof of this been supplied? (Y/N) If not highly integrated, has the device been secured with another technology which provides an adequate level of security? (Y/N)		Y Y
Do the GPS and Inmarsat modules share the same antenna which is connected to the Transceiver Box using a single cable? (Y/N)		Y
Is all the equipment capable of sustained operation in a marine environment? (Y/N) IP56 (splash proof) or IP57 capable of submersion (if applicable)		Y Indicate Rating
Is the ALC rated for operation at rated accuracy between -20 degrees Celsius and 50 degrees Celsius? (Y/N)		Y
Is the equipment supplied with materials and instructions to mount securely for use in a marine environment? (Y/N))		Y

3. INMARSAT-C TRANSCEIVER SPECIFICATIONS - Off-Line Tests

Question	Answer	Pass Y/N
Actual	Correct	
Is the unit Inmarsat approved for Class II operation? (Y/N)		Y
Is the store and forward message channel supported? (Y/N)		Y
Is the data reporting channel supported? (Y/N)		Y

4. MESSAGE FORMAT SPECIFICATION - On-Line Tests

Question	Answer	Pass Y/N

Actual	Correct
Is the format of the position report compliant with the Maritime Position Report defined in the Inmarsat-C System Definition Manual?	Y
Is the format of the polling packet to define a macro-encoded message compliant with the polling packet defined for command type 08H in the SDM?	Y
Is the format of the polling packet for data transmission compliant with the polling packet defined for command type 09H in the SDM?	Y
Is the format of the polling packet to download a DNID to an MES compliant with the polling packet defined for command type 0AH in the SDM?	Y
Is the format of the polling packet to delete a DNID from an MES compliant with the polling packet defined for command type 0BH in the SDM?	Y
Is the format of the polling packet to demand an unreserved position report compliant with the polling packet defined for command type 00H in the SDM?	Y
Is the format of the polling packet to remotely program unreserved position reporting compliant with the polling packet defined for command type 04H in the SDM?	Y
Is the format of the polling packet to initiate unreserved position reporting compliant with the polling packet defined for command type 05H in the SDM?	Y
Is the format of the polling packet to stop unreserved position reporting compliant with the polling packet defined for command type 06H in the SDM?	Y
Is the format of the polling packet to remotely program reserved position reporting compliant with the polling packet defined for command type 01H in the SDM?	Y
Is the format of the polling packet to initiate reserved position reporting compliant with the polling packet defined for command type 02H in the SDM?	Y
Is the format of the polling packet to stop reserved position reporting compliant with the polling packet defined for command type 03H in the SDM?	Y

5. GPS SPECIFICATIONS - ON-LINE TESTS

Question	Answer	Pass Y/N
Actual		Correct
What is the typical acquisition lock time from a cold start? (minutes) from a warm start? (minutes) from losing lock? (minutes)	 <5 <2 <1	 Y Y Y
What is the update rate? (seconds)		<15
What is the velocity error CEP? (knots) DRMS		<1
What is the position error CEP? (metres²) DRMS		<100

APPENDIX C: QUESTIONS AND EQUIVALENT SERIES OF TESTS FOR ARGOS TYPE APPROVAL

[TO BE DEVELOPED IN ACCORDANCE WITH PARAGRAPH 7.1]