OPERATIONS MANUAL

Unmanned Maritime Operations

Version 1 26 June 2018

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UNMANNED SEACRAFT OPERATIONS

5.8. Risk Operations Plan and Register
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CORPORATE STATEMENT AND SAFETY POLICY

X-crafts goal is to continually develop, maintain and promote a SAFETY culture consistent with a unified, sustainable and profitable maritime service whilst meeting regulatory and public service expectations for a safe and reliable service through application of company procedures detailed in the Operations Manual.

This manual documents the organisation's commitment to comply with all legal obligations relating to safety and how it intends to provide a safe operating environment for clients, personnel and the public.

It is the safety policy of the company that all elements of the organisation actively promote safety objectives and conduct aviation activities in a safe and efficient manner in compliance with New Zealand Civil Maritime Rules. The company aims to have a continually improving safety culture, which embraces accident and incident prevention, making safety the prime consideration in any operational decisions.

All personnel who undertake, or contribute to, any activity covered by the Operations Manual shall comply with the provisions of the manual at all times and adopt the standards of the company's safety policy.

Each individual is responsible for maintaining a sound knowledge of the Civil Maritime requirements and the Civil Maritime Rules relevant to their role and for performing his or her duties in a safe and efficient manner in conformity with the Operations Manual. The company undertakes to provide personnel with training and the necessary access to the Operations Manual to apply the requirements therein. Each individual has a duty to integrate safety into their activities so that the company objectives are achieved.

X-craft operates an open door policy, whereby all personnel, members of the public are encouraged to discuss or suggest improvements regarding safety concerns, training requests and business improvement proposals. The company encourages all personnel to participate fully in the company's continuous development, implementation and review of operational procedures and systems.

All of the operations procedures are underpinned by the X-CRAFT operating philosophy statement – 'Be aware and be safe'

Philip Solaris
PRIME PERSON/ CEO

0 PREFACE

PREAMBLE

Relevant copies of the manual will be provided to operational personnel as required for them to discharge their allocated duties.

The procedures in the Operations Manual are written as advice to crewmembers regarding response to anticipated events. The professional execution of these duties and procedures requires a thorough knowledge of the contents of the Operations Manual as well as an understanding of the rationale used to establish rules and procedures so that they are applied appropriately in the conduct of normal or abnormal operations.

As the contents of the Operations Manual are intended for use of company personnel only, due care must be taken to keep the information contained in the Operations Manual strictly confidential. The contents of the Operations Manual must not be made available to persons outside company employ without the permission of the Prime Person.

All copies of this manual are controlled documents. They are issued to an individual and subject to issue, distribution and revision control and must not be transferred to another person or entity. It is the recipient's responsibility to ensure that manuals are kept current and up to date with the latest amendments incorporated. Periodic checks will be made to ensure that manuals are amended and up to date.

Revisions and amendments when issued must be inserted without delay, noted on the appropriate record page and the acknowledgement returned promptly to the Manager OMS for document control purposes.

The instructions contained in the Operations Manual are to be regarded as mandatory by all crew members. The company reserves the right, either with or without notice, to take disciplinary action against any person who fails to comply with these instructions.

0.1 COMPLIANCE REQUIREMENTS

The instructions, procedures and information contained in this manual have been devised to ensure safety and standardisation in the conduct of operations. They are to be observed by all operating personnel. Personnel are also reminded of their obligation to comply with the Civil Maritime Act, Regulations and Advisory Circulars and such directives, maritime information and notices maritime New Zealand publish.

Nothing in this manual takes precedence over New Zealand law or permits unsafe operation. This could include specific permits to overfly assets owned by external parties such as NZTA, DOC, Local Council bylaws etc. who have their own policies that must also be adhered to.

Where in the light of operating experience, errors are found in the manual or deficiencies in the manner in which operations are conducted, recommendations for amendment action shall be submitted to the Chief Executive Officer.

Ongoing compliance is a requirement of this operating document with the New Zealand Civil Maritime Rules as set out in the New Zealand Maritime Transport Act 1993 and its subsequent amendments The Maritime Transport Amendment Act 2013 and Exclusive Economic Zone and Continental (Environmental Effects) Amendment Act 2013. This responsibility is handled by the Manager of Organisational Safety Management.

It is noted that Unmanned Surface (Sea) Vessels (USV) are relatively new to existing Maritime Rules and Regulations. The effect of this is that not all regulations, primarily those relating to manned sea craft, are directly applicable to unmanned craft. It is however appropriate that X-craft does everything within its power to undertake its operations with maximum safety. This includes safe operational plans and a robust safety case.

It is noted that all current X-craft Sea Vessels are less than 6 metres in overall length and experimental (non-production) craft.

Changes to the document shall be carried out in accordance with section 0.5 (page 9) and 0.6 (page 10) of this manual.

0.2 COMPLIANCE MATRIXES

Title	Compliance Manual Reference
Hazard and Risk minimisation	Part 4, P39, P43, P44
Deployment of Payloads'	2.1.8, P31
Approved Person or Organisation	1.2 , P22
Seaspace	2.1.9, P31
Visual Line of Sight	2.1.10, P32
Night Operations	2.1.12, P33
Right of Way	2.1.13, P33
Craft Mass Limits	Part B, P25
Exposition	Entire Manual
Changes to Exposition	Part A, P7,9-12

0.3 ACCEPTANCE AND SIGNATURE SHEET

All personnel must read and understand this Operations Manual and must acknowledge this procedure by signing the acceptance signature sheet. This is evidence of having read, understood and agreed to apply the procedures and data contained in this Operations Manual. If this manual is reissued or revised they must re-sign, acknowledging review of the revision.

Name	Position	Signature	Date

0.4 COMPANY POSITIONS/ RESPONSIBILITES

Company CE	P. Solaris
Prime Person	P. Solaris
Chief Operator	S. Knapp
Maintenance Controller	S. Knapp
Manager of Organisational Management Systems	S. Knapp

Changes to the Prime Person position requires prior acceptance of the director. Any such change shall be notified using the correct application form

0.5 AMENDMENTS TO MANUAL

The Chief Operator or his/her delegate(s) are the only people who can authorise revisions to the Operations Manual after such changes have been formally reviewed and approved by the Chief Executive Officer. Any Company personnel member can initiate amendments to the manual by submitting amendments in writing to the Chief Operator.

A vertical black line in the outside margin of the affected page shall identify the amended text. Incorporation of amendments is the responsibility of each manual holder. Upon receipt of an amendment, the manual holder shall incorporate the amendment in accordance with the instructions and record details of incorporation in the Amendment Record Sheet. This ensures the manual remains current for the operator, continued compliance with the civil Maritime rules. A copy of all amendments shall be provided to the MARITIME NEW ZEALAND ASAP after the amendment has been incorporated into the exposition and make any amendments the MARITIME NEW ZEALAND requires for the purpose of aviation safety.

Amendments made by the operator to this manual are not deemed to be current or active until approval has been granted by the Prime Person. Changes to this manual until approved by the Prime Person shall also not be deemed active until acceptance has been confirmed.

Amendments are by page replacement, addition or deletion.

Replace, add or delete pages as instructed in the Amendment Notice. Then complete the acknowledgement section, indicating you have received and incorporated the amendment. The person amending the *Maritime Operations Manual* should write his/her name in the 'Amended by' column, sign the 'Signature' column and record the date on which he/she inserted the updated pages.

Amendment Number	**Initial, Signature**	**Date**
Version 1		26/04/2018

0.6 DOCUMENT CONTROL

The first issue of the *Operations Manual* is shown in the footer as Version 1. Re-issues are shown as Version 2.0, Version 3.0 etc. Subsequent amendments are shown as Amendment 1, Amendment 2, Amendment 3, etc.

Amendments are marked with revision bars beside the text and summarised in the Amendment Record Sheet found in Appendix 2. The List of Effective Pages shows the current revision number and issue date of each page in the Operations Manual.

In issuing amendments, the Manager OMS or his/her delegate shall ensure that:

- Each amendment is identified as an approved document
- Adequate instructions are provided for incorporation of the amendments
- Each amendment has a sequential number (refer above for details), date of issue, justification and a revised List of Effective Pages
- A record is maintained of all promulgated amendments

The Manager, OMS Manager, or his/her delegate, shall promulgate whenever changes are issued, a memo to all personnel advising of the current revision/amendment status of all controlled documents including the Operations Manual. This memo is also to be displayed prominently on all company notice boards. All personnel must check the current revision/ amendment status before using the manual.

Any personnel member who becomes aware of the existence of a document or manual which is not current in its revision or amendment status shall advise the Manager OMS or his delegate immediately.

The Maritime Operations Manual is the master document for the **Unmanned Sea Vessel Operations** and sets out the Company's expectations in regard to operational performance, regulatory compliance, standards and policies.

Company personnel shall comply with the requirements of the Operations Manual at all times unless the safety of a voyagedictates otherwise.

Copies of this controlled document are listed below:

Company CEO	Copy 1	Printed/Digital
Prime Person	Copy 2	Digital
Maintenance Controller	Copy 3	Digital
Remote Operators	Copy 4	Digital
Manager of Organisational Management	Copy 5	Digital
Systems	Copy 6	Digital

List of Effective Pages

Page	Description	Amendment	Date Issued	Effective Date	Updated by
1. 0	Cover	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
2.	Blank	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
3.	Contents	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
4.	Contents	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
5.	Cooperate Statement	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
6.	Preface	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
7.	Compliance Requirements	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
8.	Compliance Matrix	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
9.	Acceptance Sheets	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
10.	Amendments	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
11.	Document Control	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
12.	List of Effective Pages	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
13.	List of Effective Pages	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
14.	Abbreviations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
15.	Part A- General	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
16.	Part A - Responsibilities	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
17.	Part A - Responsibilities	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
18.	Part A - Responsibilities	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
19.	Part A - Security	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
20.	Part A – Private Property	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
21.	Part A – Location of Operation	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
22.	Part A – Operational Admin	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
23.	Part A – Duty	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
24.	Part A – Operator Admin	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
25.	Part A – Operator Admin	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
26.	Part A – Operations Conduct	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
27.	Part B - USV Tech Data	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
28.	Part B – USV Tech Data	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
29.	Part B - Normal Procedures	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
30.	Part B - Normal Procedures	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
31.	Part B - Normal Procedures	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
32.	Part B - Normal Procedures	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
33.	Part B - Normal Procedures	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
34.	Part C - Induction	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
35.	Part C - Induction	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
36.	Part C - Induction	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS

37.	Part C - Induction	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
38.	Part C - Currency	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
39.	Part D – Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
40.	Part D – Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
41.	Part D – Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
42.	Part D - Risk Matrix	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
43.	Part D - Risk Matrix	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
44.	Part D - Operation Types	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
45.	Part D – R&D Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
46.	Part D – R&D Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
47.	Part D - Media Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
48.	Part D - Media Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
49.	Part D – SAR Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
50.	Part D – SAR Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
51.	Part D – Marine Survey	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
52.	Part D – Marine Survey	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
53.	Part D –Night Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
54.	Part D –Night Operations	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
55.	Appendix 1	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
56.	Appendix 1	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
57.	Appendix 2	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
58.	Appendix 3	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
59.	Appendix 3	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
60.	Appendix 4	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
61.	Appendix 4	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
62.	Appendix 5	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
63.	Appendix 5	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
64.	Appendix 6	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
65.	Blank	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
66.	Appendix 7	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
67.	Appendix 7	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
68.	Appendix 8	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
69.	Appendix 9	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
70.	Appendix 9	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
71.	Appendix 9	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
72.	Appendix 9	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS
73.	Blank	Ver 1.0	26/04/2018	26/04/2018	P. SOLARIS

0.7 ABBREVIATIONS

AA	Area Approval
AC	Advisory Circular
DAMP	Drug and Alcohol Management Plan
IAW	In accordance with
NM	Nautical Miles
M-OMS	Manager of Organisational Management Systems
RO	Remote Operator
USV	Unmanned Surface (Sea) Vessel
RX	Receiver
TX	Transmitter
VLOS	Visual Line of Sight
VMC	Visual Meteorological Conditions

1 PART A

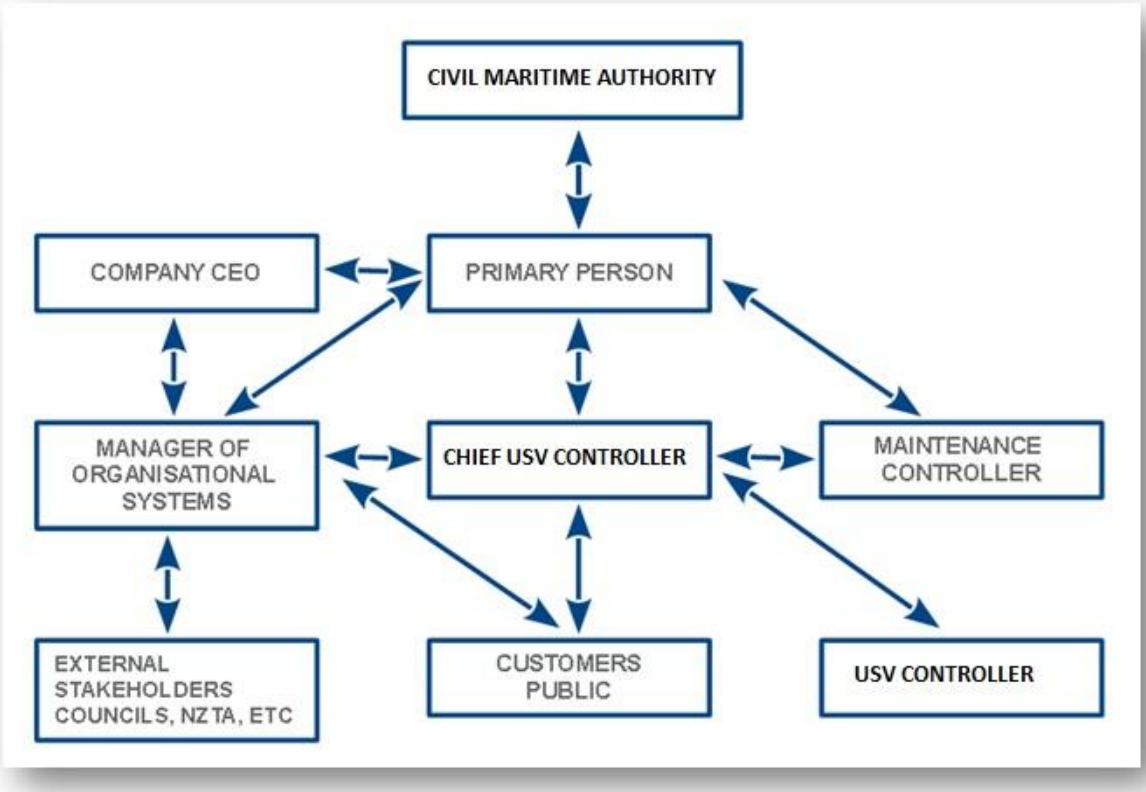
1.1 GENERAL

1.1.1 COMPANY OPERATIONS

All maritime operations using remotely operated (RO) sea craft will be conducted in accordance with the conditions and limitations placed on the Unmanned Sea Craft Operators in this document and wherever applicable within the Maritime Transport Act.

X-craft's core operations are Research and Development.

1.1.2 ORGANISATION STRUCTURE



1.1.3 RESPONSIBILITIES OF COMPANY PERSONNEL

Chief Executive Officer (CEO)
The Chief Executive Officer is either the company owner or is employed to act on behalf of the company owner and has the responsibility for the overall running of the company, in relation to this manual the CEO is also responsible for providing the prime person with the necessary power and/or authorisation to maintain safety and conduct flying operations as he/she see fit.

Primary Person
The PRIMARY PERSON has the overall responsibility for the company's compliance. The Primary Person will provide the necessary resources so that all operations and maintenance can be conducted to meet company obligations, goals and objectives. The Primary Person shall have overall responsibility for the operations the company is involved with and for maintaining compliance of X-CRAFT with Civil Maritime Rules, amendments, the operation itself and its documentation and procedures and New Zealand Law.

Chief Operator
The Chief Operator is the person appointed by the CEO. The Chief Operator is responsible for all training and operational matters affecting the safety of the companies UAOC operations. The Chief Operator Reports to the Primary Person.

The role and responsibilities of the Chief Operator are:

a) Ensuring that the company's operations are conducted in compliance with
The Civil Maritime Rules, Amendments, Advisory Circulars.

a) Maintaining a record of USV Operator; qualifications, medical certification records, training and theoretical qualifications held by each remote sea craft system Operator (USV),

b) Maintain a record of operations and duty hours,

c) Ensure the compliance and maintaining of ships logs, pre-voyage checks and operational considerations are carried out for each and every deployment and or operation.

d) Keep a record of training carried out and currency training for each and every USV operator.

e) Monitoring operational standards, supervising and training contracted USV operator,

f) Maintain a complete and up-to-date reference library of operational documents as required by X-craft of operations conducted; and

g) Be the point of contact between the company and employees and subcontractors,

h) Issue internal authorisations upon successful testing, evaluation or certification as per section C of this manual

i) Appoint persons able to give USV instruction,

j) Authorise communications with Airways Corporation for the application for seaspace approvals, the issue of notifications and any operational updates associated with USV operations.

Maintenance Controller

The Maintenance Controller is the person appointed by the CEO. He/She is responsible for ensuring the maintenance of company Remotely Operated Unanned Systems (USV) in accordance with the manufacturer specifications. The Maintenance Controller Reports to the Primary Person.

The role and responsibilities of the Maintenance Controller are:

a) Control all company USV maintenance, either scheduled or unscheduled,

a) Ensure personnel performing maintenance on the USV are competent',

b) Keep a record of personnel permitted to perform maintenance,

c) Document field maintenance using the Manufacturer's training,

d) Record manufacturers training courses completed by all Operators,

e) Develop, enforce and monitor USV maintenance standards,

f) Maintain a record and a database of USV unserviceability's,

g) Ensure that specialist equipment items are serviceable,

h) Maintain a thorough technical knowledge of the company USV,

i) Ensure maintenance activities are conducted in accordance with the procedures specified in the Maintenance Manual; and

j) Investigate all defects of the company's USV.

Manager of Organisational Management Systems (Manager OMS)

The Manager OMS is appointed by and reports to the CEO. The Manager OMS is responsible for the management of:

a) Advising and assisting the CEO in the establishment and development of the organisation's Safety Management System.

a) Assisting the CEO in the collection of information relative to the presence of hazards in the aviation environment. In this capacity, he or she will manage the Hazard Reporting system as it applies to aviation operations.

b) Coordinating appropriate responses to all hazards, accidents & incidents reported through the Occurrence Reporting System.

c) Acting as Facilitator of the Safety Group. In this capacity he will involve members of the Group in identifying and prioritizing safety issues within their areas of operation; encouraging personnel to become safety conscious.

d) Maintaining the Safety Library and compliance of this document.

e) Maintaining a record of occurrences, including mishaps during seacraft operations, maintenance, and ground support activities.

f) Investigating, analysing, and identifying trends of occurrences and hazard detection reports. Recommend appropriate accident prevention actions and strategies to the CEO.

g) Maintaining appropriate organisational aviation safety records and accident, incident, and aviation hazard statistics.

h) Providing a quarterly report to the CEO outlining the status of the organisation's voyage safety program.

i) Maintaining records of periodic inspections, corrective actions and investigations.

j) Working with management to ensure that appropriate safety issues are addressed in policy statements and initiatives. Obtaining appropriate training and education related to the safety function.

k) Provide a supply of safety related literature e.g. safety posters, periodicals, magazines, articles etc., and publish Safety Bulletins as required.

USV Controller in Command

USV Controller in Command are expected to conduct operations in a professional manner with the primary objective being safety of the operation. To that end the company has prepared this Operations Manual and all controllers employed or contracted by this company shall comply with all requirements contained within this manual. Controllers have a duty of care obligation and where there is doubt concerning any aspect of operations the matter shall be referred to the Chief Operator.

The USV operator in command of the seacraft is responsible for:

a) Planning and conduct of operations – from the start to the end of the USV operation; and

a) Safe operation of the USV craft,

b) Observe all applicable requirements of this manual,

c) Compliance with relevant civil laws,

d) Compliance with Maritime Rules and the Civil Maritime Transport Act,

e) Complete all records in respect to each voyage,

f) Comply with any legal demand to supply licences or documents for inspection.

g) Operate company seacraft in accordance with this Maritime Operations Manual

1.1.5 METRIC AND IMPERIAL UNITS

This manual makes reference to both imperial and metric units.

1.1.6 DRUG AND ALCOHOL MANAGEMENT PLAN

X-craft personnel are to maintain a zero drug and alcohol tolerance when on company operations.

1.1.7 SECURITY

Reasonable steps must be taken to prevent any sabotage, vandalism and theft to the USV.

<u>Security of Equipment</u>
During transport to and from the operational site the seacraft will be transported in a secure manner. All batteries shall be closely monitored for safe operating condition, protection and security.

Security of Documents

All operational publications, documents, manuals, procedures or expositions maintained at the company's management office shall not leave the office under any circumstances.
All job related documents at the end of each job, shall be filed in the company's management office.

Security of Job Site

At each operational site all areas the public may access must be sign posted clearly identifying USV activity and that danger exists. Should any member of the public approach the USV craft, they must be advised to remain outside the 30 metres distance

1.1.8 SAFETY/ PRIVATE PROPERTY PROVISIONS

Privacy

Nothing in this manual permits operations in contravention of the *Privacy Act 1993.*

Private Property

The USV must not to be operated in an area defined as private property without the permission/authorisation of the property owner.

If you are unable to gain the consent of the property owner and have tried all reasonable means you may carry out the operations by carrying out the following risk assessment process to ensure the risk property and persons is mitigated.

The standard format for private property operations are as follows:

1) Job Safety Assessment carried out as per Section D, Page 39 of this manual and a risk matrix completed as per Appendix 8
1) Assign the agent/ vendor or client to gain consent or;
2) A notification document is to be left in a prominent location i.e. Letterbox stating the intended date, time, duration and sea path that USV shall take. It will also consist of the property zone that is having data collection take place and the contact details for the operator involved. You must keep a record of the properties that you leave these notifications and keep evidence of such and;
3) Only properties essential to the success of the operation shall be transited through. The operator shall take every precaution to not create a hazard or increase potential for damage of persons or property and;
4) Should consent to transit a property be unsuccessful (after all attempts to obtain consent) then the property may be overflown provided that any risk to property is mitigated.
5) Risk mitigation - As a minimum the USV is not within 10 metres of any obstacle within the properties for which consent has not been granted.

6) Should consent have been refused then the property must be avoided.

Should the occupier/ property owner verbally refuse access then the operator is to either develop a different plan for the intended route or abort the operation until a plan can be put in place. While transiting between work sites the USV is to be operated over the lowest risk path to enable the USV to move to its next location. Once established in the area of operation the USV shall be positioned where possible to decrease the risk that in the event of a failure that potential injury to persons is mitigated. If the site is clear of all persons, then the USV shall be located in clear water to mitigate the risk of damage to property.

1.1.9 LOCATIONS OF OPERATIONS

The Primary operations area includes all maritime regions. X-craft operates New Zealand wide it reserves the right to operate New Zealand wide on an adhoc basis. X-craft also operates throughout the Pacific Island Nations.

The company's primary base of operations and offices are located at 9 Kokako Grove, Auckland. All training and testing of company sea craft shall take place at an appropriate testing grounds with prior approval of the relevant authorities.

Permanent changes to the location of the base of operations or the inclusion of permanent secondary bases of operations require prior acceptance of the CEO. Changes to locations shall be notified using the correct amendment to this manual.

1.2 OPERATORS ADMINISTRATION

1.2.1 CREW QUALIFICATIONS

All crew must have completed a satisfactory company. The Chief Operator is responsible to ensure personnel are trained and competent to the level of their responsibilities. That being Operators, Payload Operators, support personnel and crowd control

All Crew shall have and maintain the following minimum qualifications.

1) X-craft Technical Training and proof of Maritime Law knowledge

All support crew that are to act in an official capacity are to be trained appropriately for their role

1) If required to monitor radios, an FRTO cert is mandated.
2) Observers require training, and proof, of Maritime Law knowledge

Observers that are utilised to assist in seaspace shall:

1) Have been briefed by the Operator as to the extent of their responsibilities and;
1) Have signed in the appropriate place on the Work Method Statement- Appendix 8

1.2.2 REMOTE OPERATOR RECORDS

The company shall maintain a Operator personnel file containing the above mentioned documentation as per 1.2.1

Individual Remote Operator are responsible for their own remotely operated sea craft (USV) logbook. The method for logging flights will be an Operators Log Book or Digital equivalent containing voyage hours.

Individual remote Operators are required to carry their own identification with them on operations.

1.2.3 REMOTELY OPERATED SEA CRAFT AUTHORISATIONS AND VOYAGE RECORDS

If there is more than one operator each operation is to be authorised by the Chief Operator. Operational authorisation is at Appendix three.

1.2.4 RECENCY REQUIREMENTS

1. The Remote Operator shall also log a minimum of 3 hours Sea Time within a 90-day period.
2. The Remote Operator must have undergone X-craft training within a six month period.

1.2.5 DUTY AND OPERATIONAL TIME LIMITATIONS

The Chief Operator is responsible for the operational standards and supervision of the remote operators who are employed by the company.

Remote Operators are to maintain an Operations and Duty Record in accordance with the following prescriptions.

Duty Time; Duty time is time on site for the purpose of work for the gain of X-craft. This includes travel time, preparation and record keeping.

Operational Time: Operational Time is from the start of the control of the USV switching on till the switching off of the control transmitter with the intention of voyage.

No Operator shall work greater than 50 Hours Duty/ week, or 207 hours' duty/ calendar month.

Operational time shall not exceed 10 hours per day / 20 hours / Week, 40 hours / fortnight or 80 hours per calendar month.

If the Remote Operator works for more than one employer, then the RP shall keep a record of total hours worked and shall not exceed them under any circumstances.

Should an Operator at any time feel pressured to complete work while fatigued or in a condition whereby they are medically or physically unfit to work they shall stop all works and contact the Chief Operator.

1.3 REMOTELY OPERATORED SEACRAFT SYSTEM ADMINISTRATION

1.3.1 METHOD OF RECORDING HOURS IN SERVICE AND UNSERVICEABILITY

X-craft Operators are required to maintain a log of hours and minutes in service and any defects or unserviceability. Refer Appendix 4

1.3.2 PERSONS PERMITTED TO OPERATE REMOTELY OPERATED SYSTEM CONTROLS

Persons cannot operate the USV unless they have received appropriate training authorised by the Chief Operator.

1.3.3 AUTHORITY FOR MAINTENANCE

The Maintenance Controller is responsible for keeping records of personnel that may perform maintenance. Only personnel approved by the Maintenance Controller shall carry out Maintenance.

Daily maintenance such as pre-operation and post operation checks shall be carried out by the USV Operator.

1.3.4 DANGEROUS GOODS

The carriage of dangerous goods for the purpose of maritime transportation is not permitted.

Parts of the USV may be classified as dangerous goods during transportation by sea, land or air for the purpose of relocation to job sites. The following guidelines must be used:

For transportation via sea land or air not in company vehicles then the batteries shall be discharged to safe storage voltage, terminated appropriately and housed in fire prevention containers.

Before transportation via public transport then X-craft shall check with limitations imposed by the carrier and adhere to those such requirements.

All support equipment shall be stored in appropriate cases to protect equipment from the elements and tamper from outside individuals. Equipment shall remain either securely locked or under supervision.

1.3.5 WEATHER PROTECTION

The USV shall not be operated in conditions outside of weather condition limitations set by the manufacturer.

Conditions whereby the USV is not to be operated shall be located in the specific USV Manual.

The USV is not permitted to operate in wind strengths and sea states greater than permitted by the manufacturer and or in weather conditions to which the USV is being operated in.

1.3.6 REPORTING TO MARITIME NEW ZEALAND

The approved method of reporting of all incidents, accidents or near misses and all correspondence of any matter shall take place through the Chief Operator.

The Primary Person is a contact point for Maritime New Zealand with regards non-accident related concerns.

Any of the above shall require notification to the applicable units within Maritime New Zealand via the standard reporting.

1.3.7 SEACRAFT MASS LIMITS

Current X-craft seacraft are less than 6 metres in overall length and less than 2 tons in weight.

1.4 OPERATIONAL CONDUCT

1.4.1 NON-COMPANY VISITORS

Non-company visitors must not come within 10 metres of the USV during operation. The Controller/Remote Operator must provide a safety briefing. Please See Appendix 5

1.4.2 HAND OVER/TAKE OVER PROCEDURES

A hand over take over procedure is required, when there are two Operators, to positively identify an action and ensure it is understood by the participants.

This is only to take effect should the type of operation require extended operations time or distance beyond VLOS.

The only event whereby a change of controller may take place is when either the USV is to be operated in full automation and taken out of automation for emergency purposes or if a controller is unable to control the craft due to a sudden medical or physical disability

And;

This eventuality should only be required if the USV is not placed into failsafe Return to Home function.

1.4.3 REMOTE OPERATOR BRIEFING INCLUDING EMERGENCY PROCEDURES

To ensure co-ordination in a multi crew environment a briefing must be conducted prior to the commencement of any operation. Refer to Appendix five. Also Emergency Procedures Section Three of Unmanned Maritime Manual

1.4.4 USE OF CHECK SHEETS

Check lists form the basis of all operations. They minimise the human component of failure. Company supplied checklists must be used. Please refer to the USV Manual for details

1.4.5 OPERATIONAL AUTHORISATION

All operations shall be authorised by the Chief Operator. The Chief Operator may at his/her discretion give written consent to a USV controller to self-authorise operations.
The authorisation check sheet can be found at Appendix 8.

1.4.6 IDENTIFICATION OF OPERATOR AND CREW

All Operators and crew shall wear high visibility vests and company crew shirts prior to and during the operation. Adequate PPE for each operation shall also be worn.

2 PART B

2.1 OPERATING THE REMOTELY OPERATED SEACRAFT SYSTEM

2.1.1 SPECIFIC SEACRAFT OPERATING PROCEDURES

The Seacraft will be operated in accordance with the manufacturers operating instructions, which are part of the USV Manual. Company initiated variation to the USV Manual will require supplementary documentation and approval from the manufacturer before implementation. The basic configurations as listed below shall not be altered unless notification to and acceptance and thus response from the Chief Operating Officer and Prime Person have taken place.

2.1.2 REMOTELY OPERATED SEACRAFT SYSTEMS TECHNICAL DATA/SYSTEM SPECIFICATIONS

1) X-craft : Taniwha Class - **IN USE**

Type	Multirole		
Identifier	Taniwha		
Construction	Composite		
Control System			
TX			
Max Weight			
Certified Weight			
Motors			
Propellers			
ESC			
Battery			
Data Link			
Max Wind			
Max Sea State			
Overall length	2.2 metres		
Payload			

2) X-craft : Proteus Class - **IN USE**

Type	Multi-role		
Identifier	Proteus		
Construction	Composite		
Control System			
TX			
Max Weight			
Certified Weight			
Motors			
Propellers			
ESC			
Battery			
Data Link			
Max Wind	.		
Max Sea State			
Overall length	5.8 metres		
Fall Arrest System			

RESERVED FOR FUTURE UPDATES

2.1.3 NORMAL PROCEDURES

All X-craft Operators must use the USV Manual supplied checklists. Please reference the USV Manual for details

2.1.4 PRE-OPERATION PROCEDURES

Pre-operation and post-operation checks are mandatory. It is the Controller/Remote Operators responsibility to ensure the seacraft is seaworthy prior to any voyage. Refer to USV Manual for pre and post operation procedure checklist.

2.1.5 FUEL/ BATTERY DOCUMENTATION

Battery condition is to be monitored using the equipment provided. No operation shall start with a battery that is less than 50% charged. Cell imbalance is to be monitored, and only balance charged.

Battery Voltage and/or mAh used shall be monitored to ensure safe voyage times.

Manufacturer's instructions for correct fuel specification and/or follow manufacturers' battery documentation especially relating to charge/discharge rates must be followed.

All Battery Conditions are to be recorded and a record of the number of charges each battery has had in its lifetime shall be logged. Date each battery entered service shall also be recorded on the battery and logged in the USV Logbook under the batteries number.

After 100 Charges the battery shall be logged into maintenance and checked. Logging of battery usage to be marked on the battery in permanent ink.

2.1.6 SEACRAFT TEST OPERATIONS

When completion of maintenance requires a test operation, the person completing the maintenance is responsible to ensure a satisfactory test operation is completed. The Maintenance Controller is responsible to ensure this happens. An appropriately qualified Operator shall carry out the test operation and a logbook entry made.

A release to service statement and acceptance to be made by both the maintenance provider and the test Operator before the USV is returned to line.

2.1.7 MINIMUM OPERATIONAL DISTANCES

When operating the USV a minimum distance from all objects, structures and people associated with the operation shall be no less than 10m diameter around the USV, unless the specific operation dictates closer proximity and all parties are in agreement.

- Operations Area- The total area the USV is to be operated in is considered to be the operating area and shall be clear of all persons not directly involved in the operation.
- Sterile Area- This area is the launching and landing, rigging and servicing area of the USV during operations. Only the Operator and approved personnel documented on the work method statement may enter this area
- Transit Lane- This area is a lane where the USV my transit from one place to another or operate alongside objects, structures or people. This area is to be clear of all persons at all times.
- Emergency Landing Site- This area is identified as the emergency landing location for the USV should there be an emergency of any kind. For larger operational areas multiple emergency landing sites may exist.

2.1.8 DEPLOYMENT OF PAYLOADS AND / OR HANDLING OF PAYLOADS

Deployment of objects is permitted as long as it does not create a hazard to persons or property on the ocean. Operations are to be conducted within the specifications found in Part D of this manual. A risk assessment and safety assessment is to be carried out.

2.1.9 SEASPACE CLASSIFICATION AND USAGE

Seaspace considerations associated with operating and USV shall be adhered to.
All Operators are to be familiar with the designation of and restrictions involved with sea operations before water operations are to take place. If the Operator is not familiar, then voyage with the supervision of an Operator who is familiar shall be required. Selection of this such Operator shall be the responsibility of the Chief Operator.

Seaspace Types:

- **Restricted Seaspace** The operation of a USV within a Restricted Area shall not take place unless approval to operate within this zone by the administering authority
- **Military Seaspace** The operation of an USV within a Military Area shall not take place unless approval to operate within this zone has been issued by the administering authority
- **Danger Area** The operation of a USV within a Danger Area shall not take place unless the Operator has established that the activity associated with the danger area will not affect the safety of the USV or other users of the Danger Area.
- **Controlled Seaspace** Controlled Seaspace aforementioned is to be used by USV shall only take place when the approval to operate within the Seaspace is granted by the administering authority and the Operator is under the direct supervision of an approved organisation administering that area or given permission by the relevant authorities to do so.

2.1.10 VISUAL LINE OF SIGHT OPERATION

VISUAL LINE OF SIGHT

The Operator must at all maintain Visual Line of Sight with the USV without prior authorisation from the relevant authorities. Visual Line of Sight is determined as follows. A distance that in a straight line between the USV and the operator is no greater than the point or position that if required the Operator can make a singular movement in a determined direction and the USV will move in that direction. This distance should not exceed 5km in any direction.

The operator shall also not obstruct the view between the USV and the operator in any way or operate in meteorological conditions whereby the view of the USV is diminished in any way. The USV shall at all times be operated below the cloud base and the operator shall at all times have clear visibility over the surrounding seaspace the USV operates in.

The Operator or Payload Operator shall at no time use any device other than spectacles, contact lenses or other prescription device to correct vision. Should the Operator or Payload Operator require such a device then a spare shall be carried on the person at all times while operating the USV. No other means or method of vison correction or enhancement shall be used.

EXTENDED VISUAL LINE OF SIGHT (EVLOS)

During operations where line of sight may need to be extended the Operator may at its discretion, and with a second Operator as an observer, extend the distance in which it operates whereby the USV is no longer within VLOS as set out in 2.1.10 Paragraph 1.

Each operation requiring EVLOS shall complete a Work Method Statement detailing why EVLOS is required and a Risk Matrix. Appendix 8 and 9 of this manual.

The Operator team:

a) Have clear and unobstructed view of the surrounding seaspace and;
a) Be aware of all hazards within that seaspace and;
b) Maintain a listening watch on the appropriate radio frequency; and
c) Make standard radio calls to the area station at 5 minute intervals if required and;
d) Have notified all other seaspace users (boat operators, public etc.) of their presence and intended path and duration
e) The distance in which the Operator team may operate shall not exceed 20km in any direction without specific approval by the relevant authorities to do so.

The USV:

a) Be fitted with telemetry giving the Operator team a constant read out of distance from the home point, heading, speed, fuel / battery state and position relative to the home point or GPS

a) Have a redundancy means whereby should control of the USV or control signal be interrupted the USV shall enter a return to launch (RTL) function and return to the home point.
b) Be fitted with high visibility markings and a strobe light fitted above the USV for other maritime traffic users.

FIRST PERSON VIEW (FPV)

FPV systems can be used if the Operator has a payload operator or systems manager present. The payload operator or systems manager is to also be a current USV Operator and be noted as such in the work method statement for the operation.

The payload operator at all times shall:

- Maintain visual line of sight with the USV
- Have clear visibility and understanding of the seaspace surrounding the USV at all times
- Be briefed and versed in standard phraseology
- Maintain direct communications with the Operator of the USV.

2.1.12 NIGHT OPERATIONS

Night operations are permissible only if the Operator adheres to the approvals for night operations are adhered to in Section D of this manual.

2.1.13 RIGHT OF WAY

A person operating an USV shall at all times give way to all manned seacraft. Should a manned seacraft pose a threat to the USV such as in the situation where a manned seacraft is operating without navigation lights or counter to sea navigation law then the USV is to either take immediate evasive action or stop immediately until such a time as communications between the USV can be established and the intentions of the manned seacraft are identified.

2.1.14 INITIAL SEAWORTHINESS STANDARDS

USV added to this manual even if brand new shall undergo a six monthly inspection as found in the maintenance manual before operations may commence.

If the USV is not zero timed, then an estimate + 5% must be applied as its initial time in use on the maintenance release.

3 PART C

3.1.1 INDUCTION

X-craft's Chief Operator is responsible for inducting new personnel or re-inducting returning personnel and the continued competency and currency of its current personnel. The following section describes the method that must be used for induction and currency of company and outside USV Operators.

3.1.2 NEW PERSONNEL

Each new or returning personnel member shall complete the Induction Schedule document for X-craft. New USV Operators shall work under supervision either direct or indirect for the first three months of their start date at X-craft. X-craft reserves the right to extend this period as it sees fit.

If X-craft has genuine concern for the safety of operations with regards to a new Operator, then remedial training shall take place. If X-craft feels that there has been negligence, then disciplinary action and/or termination may result.

A checklist of Items Completed and kept in the personnel file is found in the Appendix 3.

3.1.3 Theoretical Training

Topic	Inductor
LAW, Weather Sea State Lessons Basic USV Hydrodynamics Local Weather and access to Weather Seaspace and local procedures Operations Manual, USV Manual, SMS and Risk Assessment exercises	Chief Operator
USV Technical Theory Specific information to the operation of the USV including manuals and documentation on systems and performance	Chief Operator
Open Book Test Relevant information relating to the USV and legal requirements **Closed Book Test** USV specifics and scenario based questioning	Chief Operator

3.1.4 Practical Training Shore Based

Topic	Inductor
Area Familiarisation Risk Assessment Risk Mitigation Outside factors Suitable Staging Area, Transit Routes, Operations Areas	Chief Operator
Systems Handling Functionality and start-up of systems Description of all common components Handling of system Description and inspection of machine and all of its related parts Construction and deconstruction of the system Detailed explanations on the use of the transmitter and operating frequencies, limitations thereof Use of any other operating software, such as display panels Controls and associated seacraft theory Maintenance and inspection training Problem solving, fault analysis Post operations related matters	Chief Operator
Charging Operation of DC and AC Chargers	Chief Operator
Ancillary Equipment Operation of Ground Station Operation of Various Payloads	Chief Operator

3.1.5 Practical Training Sea Trials

Topic	Inductor
Basic Handling and Controls Hand-over of controls Basic MR Handling skills	Chief Operator
Launching and Landing Launching Teach effects of wind and swell Teach landing techniques	Chief Operator
Basic Manoeuvres Power Changes Turns Approaches Missed Approaches Operational control modes	Chief Operator
Hazardous Conditions Sea State Loss of Power Stalls Home lock Failsafe Critical Thinking – no win situation Loss of GPS control – Manual Operating Emergency Loss of Visual Line of Sight	Chief Operator

3.1.6 Sea Test

Topic	Inductor
Shore Based Law Hydrodynamics Risk Assessment Scenario – briefings, plans, emergency procedures, etc. Mission construction Payload configuration Workflow	Chief Operator

3.2 CURRENCY/ RECENCY TRAINING

X-craft USV Operators must have a current training from the X-craft Chief Operator.

Annual Reviews shall consist of a repeat operational tests. Failure of this test results in an instant stand-down from operations and remedial training takes place.

3.3 CONVERSION TRAINING

Internal and external training is taught using the same principals.

Conversion training from a different UAS system shall follow the procedure for induction with regards to 3.1.3, 3.1.4.3.1.5 and 3.1.6.

Upon completion of Theoretical and Practical Training and testing the candidate shall give written acknowledgement in the candidates Operators Log that they have qualified him/her as operator trained on that specific type/specification/variation.

4 PART D

4.1 OPERATIONS

X-craft uses the following process to determine whether a specific operation is legal, safe and cost effective. Often safety requirements alter the cost effectiveness of an operation. If the safety considerations cannot be mitigated within the operational cost the operation must be rejected.

4.1.1 FEASIBILITY CHECK AND JOB SAFETY ASSESSMENT

The following documents shall be used to measure Risk and consequence for all operations.

1) Flow Chart

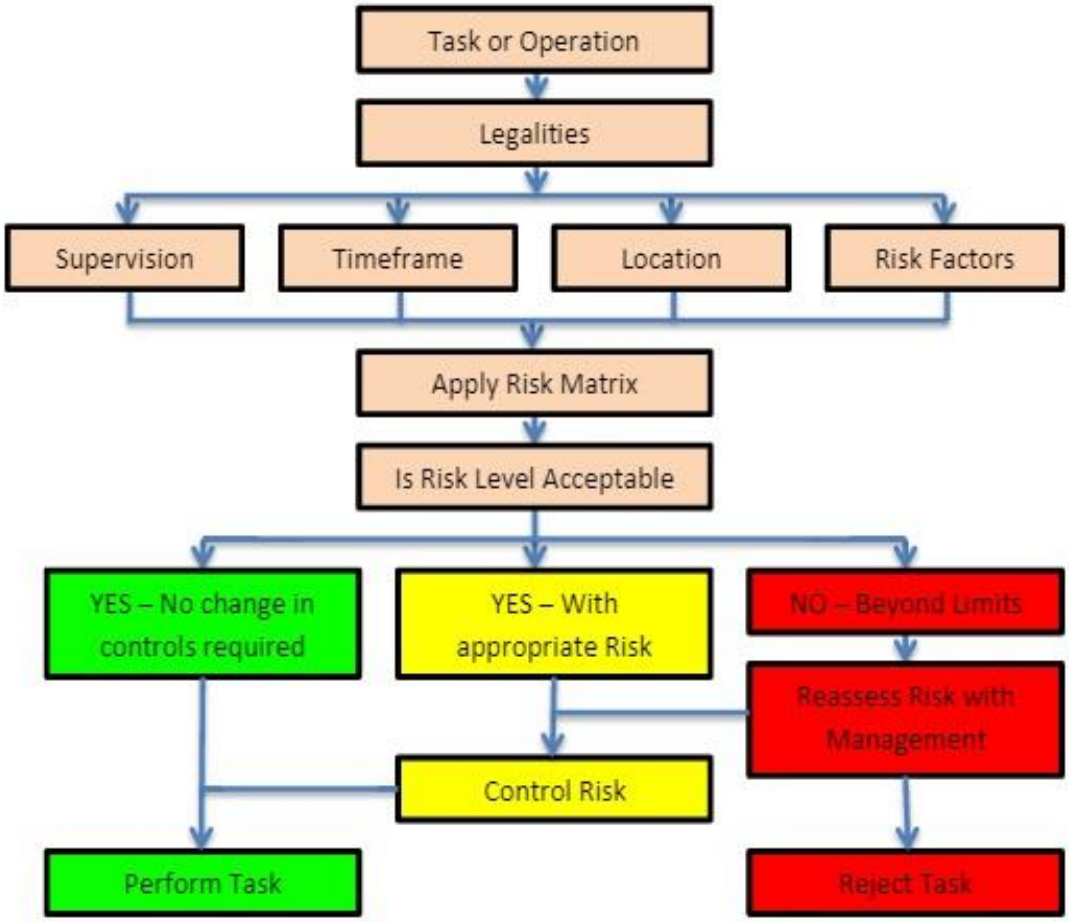
   The flow chart is a means or organising Planning and Risk

1) Risk Matrix Specific to USV Operations
2) Job Safety Assessment (Appendix 6) and Risk Operations Plan/Work Method Statement and Job Safety Assessment Appendix 7/8 and Risk Register Appendix 9

These documents must be used in conjunction with each other and once complete will give a clear indication of whether an operation or task is safe and legal. This Risk Assessment/ Operations Brief Shall forms the basis of all operations.

These Operations Briefs shall be kept on record for two years at X-craft

Flow Chart



Task or Operation

- Identify the Task to be completed and does it comply with approvals granted from legal authorities.
- Within all conditions listed in the schedule for the USV OC
- Not prohibited by any other New Zealand Laws, Policies or Rules
- Privacy considerations
- Private owner's permission
- Consent of asset owner
- Maritime Notifications

Supervision

- There are three levels of supervision catered for;
    - Direct- Under the direct supervision of the Chief Operator
    - Indirect – The Chief Operator must be briefed and give consent to carry out the operation
    - Unsupervised- the USV controller may make decisions and proceed without direct guidance. The Chief Operator must however still be notified of all operations and can choose to supervise at his/ her discretion.

Timeframe

- Has enough time for all the necessary investigations been allowed for? Under no circumstances should the Operator feel pressured to carry out an operation or task if there is not enough time to plan and manage risk.

Location

- Seaspace considerations - Maritime New Zealand Approval
- Population density considerations
- Position related to a recognised port
- Environmental considerations
- Local restrictions, bylaws
- Implementation and control of the operations area, sterile area and transit lanes

Risk Factors – these are examples and do **NOT** represent all risks involved

- Gathering the necessary maps and charts (either hard copy or electronic) for the area
- Determining the weather is suitable for the machine and the operation
- Reviewing the NOTAMs related to the operations area
- Possibility of person moving into the area of operation or landing area during voyage
- Suitable launching and landing areas (including alternate landing area)
- Ability to maintain adequate separation from the public
- Obstructions (rocks, reefs}
- Possible radio interference
- Ability to maintain visual line of sight
- Operators/ Crews ability matches location/task
- Need for signage and / or notifications

Apply Risk Matrix

- Use the Risk Matrix to ascertain the raw level of risk and explore ways to reduce the risks that exist to make the operation safe and successful.

Is the Risk Acceptable?

- YES – No change in controls required
    - If the operation is safe without either outside assistance or changes to the operation then proceed
- YES – With appropriate risk controls
    - If there are requirements to close reefs, rocks, alter sea routes etc. then these changes can be made and then the operation may proceed.
- NO – Beyond Limits
    - Escalate the operation or task to the Chief Operator and ASO for review. Maritime New Zealand Approvals or other means may make the operation safe. Other considerations such as the use of USV, cranes or buoys can also be considered in place of the USV. If the alteration, then makes the operation safe then proceed with Risk Control in place
- Reject Task - If there are no way of mitigating risk or X-craft feels it is outside of its capabilities the operation or job must be rejected.

Risk Matrix

The matrix below is the document used when the risks have been identified throughout the site visit. Each individual risk item is given an initial Risk Factor based on the Matrix. Should the risk be outside of acceptable margins then different levels of intervention are required to either reduce the risk or to reject the operation entirely.

Example as follows:

Risk of Sunburn- Winter = Low Risk Factor 2 – No intervention required
Summer = High Risk Factor 6-7 Moderate intervention required

From here the intervention applied would be sunscreen, hats, long sleeved shirts and reducing the risk to a risk factor of 2.

The third document to be used being the Operations Plan and Work Method Statement covers all the risks typical to the operation and allows for others to be added. This is finalised before the operation takes place. A Google Earth map of the operational environment showing staging area, emergency landing area and sterile areas shall be attached to this document.

The Operations Plan and Work Method Statement is found in the Appendix 7/8. Should the operation carry such risk that falls outside the boundaries of this document the Chief Operator shall inform and seek the involvement of Maritime New Zealand.

Risk Assessment Matrix – Assessing Each Risk

Score Factor	
>7	Detailed Intervention, Management Required
6,7	Intervention from Chief Controller Required
4,5	Submission of Action plan to ASO/Chief Controller
<4	Manage by USV Controller

Organizational	No Impact	Operational Delay	Business Interruption	Fines/ conviction	Conviction/ Closure/	Prison/ Closure
Reputation	Explore Improvements	Internal Review	Internal Audit	External Involvement	Inquiry/ Media	Investigation
Environment	No Impact	Slight Damage	Temporary Closure of public space	Moderate / Irreversible Damage	Permanent Damage	Total loss of form
Assets	No Damage	Field Repair	Out of Service	Partial Loss	Total Loss	Non Insured
People	No Injury	First Aid Needed	Hospitaliz-ation	Disability	Single Death	Multiple Death

Consequence →

Probability			Insignificant 0	Minor 1	Moderate 2	Major 3	Severe 4	Catastrophic 5
	1/10	Occur Often	Almost Certain (5)	5	6	7	8	9	10
	1/100	Possibly Occur	Likely (4)	4	5	6	7	8	9
	1/500	Could Occur	Possible (3)	3	4	5	6	7	8
	1/1000	Might Occur	Unlikely (2)	2	3	4	5	6	7
	1/5000	May Occur	Rare (1)	1	2	3	4	5	6
	1/10000	Very Unlikely	Extremely Rare (1)	0	1	2	3	4	5

The Risk Matrix and supporting evidence shall form the basis of a submission to seek an approval on a case by case basis. Appendix 9- Hazard Register lays out the flow of information, gathering required and procedures to carry out the operation.

Example

Risk Assessment Matrix – Assessing Each Risk

Score Factor	
>7	Detailed Intervention, Management Required
6,7	Intervention from Chief Controller Required
4,5	Submission of Action plan to ASO/Chief Controller
<4	Manage by USV Controller

Organizational	No Impact	Operational Delay	Business Interruption	Fines/ conviction	Conviction/ Closure/	Prison/ Closure
Reputation	Explore Improvements	Internal Review	Internal Audit	External Involvement	Inquiry/ Media	Investigation
Environment	No Impact	Slight Damage	Temporary Closure of public space	Moderate / Irreversible Damage	Permanent Damage	Total loss of form
Assets	No Damage	Field Repair	Out of Service	Partial Loss	Total Loss	Non Insured
People	No Injury	First Aid Needed	Hospitaliz-ation	Disability	Single Death	Multiple Death
Consequence		Insignificant 0	Minor 1	Moderate 2	Major 3	Severe 4	Catastrophic 5

Probability	1/10	Occur Often	Almost Certain (5)	5	6	7	8	9	10
	1/100	Possibly Occur	Likely (4)	4	5	6	7	8	9
	1/500	Could Occur	Possible (3)	3	4	5	6	7	8
	1/1000	Might Occur	Unlikely (2)	2	3	4	5	6	7
	1/5000	May Occur	Rare (1)	1	2	3	4	5	6
	1/10000	Very Unlikely	Extremely Rare (1)	0	1	2	3	4	5

4.1.2 ACCIDENT/INCIDENT REPORTING

Any accident or serious incident involving injury or property damage must be reported via the standard reporting format through the use of standard processes with Maritime New Zealand.

Further any accident or incident of any nature is to be reported to the company ASO immediately. The ASO shall investigate the incident/accident and will form an integral part of finding the correct outcome.

4.1.3 TYPES OF OPERATIONS

All applicable operations must be carried out within the limitations and conditions in the schedule of the UAOC

The Operator must not cause anything to be deployed or discharged from an unmanned seacraft in any way that may create a hazard to another USV, person or property.

X-CRAFT conducts the following types of operations:

- RESEARCH AND DEVELOPMENT
- EMERGENCY RESPONSE OPERATIONS
- SCIENTIFIC SURVEYING
- NIGHT OPERATIONS

These operations may be subject to other local or regional laws and must be complied with.

RESEARCH AND DEVELOPMENT OPERATIONS

PURPOSE AND SCOPE

The Company may operate USV purely for the purpose of Research and Development. This may include but is not limited too

- Unique prototype USV
- Hydrodynamic modifications
- Payload development
- Performance evaluation
- USV control system development

OPERATOR QUALIFICATIONS

The Operator in command of the USV must

- Have completed full induction into X-craft operational procedures
- Have a demonstrable understanding of Maritime laws and regulations

USV REQUIREMENTS

The limitations and requirements imposed by the specific USV design parameters or, where existing, USV Manual and supplements shall be followed at all times.

- The USV must be thoroughly inspected to a level exceeding a normal pre-operational procedure before operations
- The USV must be thoroughly tested on the ground to ensure control systems and payloads do not cause RF conflict or interference with any operational systems.

SPECIAL APPROVALS OR EXEMPTIONS

The Operator in command is responsible for ensuring that any operation or procedures is safely conducted within normal USV operating parameters.

When engaged on an R&D sortie the Operator in command is not absolved from any action brought against them under common law in respect of noise, damage to property or injuries to persons caused by such operations.

OPERATING AREA LIMITATIONS

All sea operations shall be in visual meteorological conditions and in accordance with the relevant Civil Maritime Regulations, rules and procedures unless specific exemptions have been granted by Maritime New Zealand.

The USV must be operated over uninhabited property (sea zones) that the owner has given consent to.

USV OPERATING PROCEDURES

The Operators shall at all times have a payload operator or systems manager present and continuous communications between the two parties shall be required. In recognition that such operations are by their nature special events, a heightened level of safety standard must be applied that exceeds conventional sea operations. The Operators shall ensure that sea operations are only permitted if the pre-operation hazard assessment achieves the lowest possible level of risk and maximum operational safety is achievable.

EMERGENCY RESPONSE OPERATIONS

PURPOSE AND SCOPE

The Company may carry out Emergency Response Operations involving various tasks such as

- Search and Rescue of lost persons
- Inspecting and documenting a sinking zone
- Dropping of emergency resources
- Monitoring of damage caused by Cyclones, Tsunami, Flooding etc.
- Post disaster relief operations

SPECIAL APPROVALS OR EXEMPTIONS

- The Operator in command is responsible for ensuring that any operation or procedures is safely conducted within normal USV operating parameters.
- When engaged on a Search and Rescue mission, especially a BVLOS operation, the Operator in command is not absolved from any action brought against them under common law in respect of noise, damage to property or injuries to persons caused by such operations.
- The operator is to have written documentation requiring the services from a recognised Search and Rescue authority.
- If EVLOS operations are to be used all EVLOS operations shall be conducted outside of port areas unless the port operator has given consent regardless of other approvals granted to this certificate and;
- The operator shall make regular radio reports on the appropriate frequency and;
- The USV is not to be operated in seaspace that the Operator and observer cannot visually see unless authorisation by the relevant authorities has been given.
- The operator shall not breach seaspace zones without the authority of Maritime New Zealand. This includes zones where the operator cannot contact the governing authority.

CREW MEMBER REQUIREMENTS

The Operator in command of a Company USV carrying out SAR operations must:

- Have a qualification issued by an approved organisation or person;
- Hold a FRTO Rating
- Have ocean operating experience of not less than 50 hours logged experience.
- If EVLOS operations are to be used for the Search and Rescue operation the Operator must have at least 50 hours logged experience in EVLOS operations with an observer before operations on Search and Rescue operations
- Have a trained and competent observer present during all sea activities

The observer engaged in Search and Rescue operations shall;

- Have a qualification issued by an approved person or organisation and;
- Be trained and competent of the type of USV being used and;
- Be either an employee or contract Operator under this certificate and;
- Have search and rescue experience relevant to the operation and;
- Shall be trained and hold an FRTO rating to make radio calls

USV REQUIREMENTS

The limitations and requirement imposed by the particular USV Manual and supplements shall be followed at all times.

CREW BRIEFING

The Operator in command is ultimately responsible for the safety of the crew. Only essential crew members shall be involved with the operation of the USV and its equipment.

OPERATING AREA LIMITATIONS

All search and rescue operations shall be carried out in visual meteorological conditions and in accordance with the relevant Civil maritime Regulations, rules and procedures unless approval has been granted by Maritime New Zealand.

Prior to commencement of the operation, the Operator in command shall ensure that:

- They have gained a proper understanding of the client's requirements;
- All concerned are in agreement with the proposed plan of action; and
- Those persons involved in the particular mission including observers and shore parties (if any) are adequately briefed on their duties, the signals to be used, the general conduct of operations and safety precautions to be observed.

USV OPERATING PROCEDURES

- Normal control communications for sea work operations will be observed.
- If on EVLOS operations the USV is to be fitted with High Visibility markings and;
- The USV is to be fitted with a purple strobe light on the top of the craft which has a visual range of not less than 5nm and;
- The USV is to have an FPV system fitted whereby no matter the orientation of the payloads' the Operator can see the telemetry of the craft. This system is to be fitted independent of the payload system and;

- Have telemetry system in place to give the Operator the distance, speed of the craft and the total operational time remaining.
- VHF radio communication link with any crew on the USV is compulsory.
- Any crew on the USV must wear life jacks at all times.
- A fire extinguisher must remain mounted on the USV in an exterior location at all times.

SCIENTIFIC SURVEY

PURPOSE AND SCOPE

Company USV may be utilised to conduct a variety of scientific survey operations such as hydrographical and acoustic survey or other tasks of a like nature.

All surveying operations shall be operated in checked meteorological conditions and in accordance with the relevant Civil Maritime Regulations, rules and procedures unless specific approval has been otherwise granted by Maritime New Zealand.

SPECIAL APPROVALS OR EXEMPTIONS

The Operator in command is responsible for ensuring that any operation or procedures is safely conducted within normal USV operating parameters.

When engaged on a Survey sortie, the Operator in command is not absolved from any action brought against them under common law in respect of noise, damage to property or injuries to persons caused by such operations.

USV REQUIREMENT

The USV is to be operated in with respect to procedures found in the USV Manual. Waypoints procedures shall be found in the Supplements section of the USV Manual.

CREW MEMBER REQUIREMENTS

The Operator in command of a company USV carrying out low level aerial surveying operations must:

- Have a qualification issued by an approved organisation or person and;
- Have logged 5 hours' survey experience including at least 1 hour autonomous operations.

OPERATING AREA LIMITATIONS

Before launch, the Operator shall ensure that they have gained a proper understanding of the requirements, that all concerned have reached agreement on the proposed plan of action and any person essential to the operation is adequately briefed on the conduct of operations and safety precautions to be observed.

The Operator in command shall take all reasonable steps to ensure that:

- The nature of the operational zone that will permit safe landing and launching;
- The area is clear of all objects and aquatic life likely to be a hazard in manoeuvring the USV.
- In all instances it is recommended that the Operator adopt the same technique as for operations in bad visibility and reduce speed to the lowest safe speed and coarse applicable to that USV.
- The Operator must be constantly aware of the direction and speed of the weather conditions and the possibility of encountering differing local weather conditions.

NIGHT OPERATIONS

PURPOSE AND SCOPE

The company may carry out night operations involving various tasks such as

- Scientific or Research purposes
- Surveillance
- Search and Rescue

SPECIAL APPROVALS OR EXEMPTIONS

The Operator in command is responsible for ensuring that any operation or procedures is safely conducted within normal USV operating parameters.

When engaged on a night sortie the Operators in command are not absolved from any action brought against them under common law in respect of damage to property or injuries to persons caused by such operations.

OPERATING AREA LIMITATIONS

All night operations shall be carried out in visual meteorological conditions and in accordance with the relevant Civil Maritime Regulations, rules and procedures unless approval has otherwise been granted by Maritime New Zealand.

- Minimum Visibility of 2km

If the above mentioned minimums are not present as per the forecast or by visual inspection, then no night operations are to commence.

Operators should be constantly aware of the following manoeuvring hazards at low level likely to result in loss of height or loss of control:

- Turning with an ill-defined horizon and visual range
- Distraction of the Operators attention, particularly during turns;
- Manoeuvring off axis

Prior to commencement of the sortie, the Operator in command shall ensure that:

- They have gained a proper understanding of the operational requirements;
- All concerned are in agreement with the proposed plan of action; and
- Those persons involved in the particular mission including payload operators,

- Observers and other shore parties (if any) are adequately briefed on their duties, the signals to be used, the general conduct of operations and safety precautions to be observed

USV OPERATING PROCEDURES

The Operator shall at all times have a payload operator present and continuous communications between the two parties shall be required.

The USV is not to be operated off axis unless the USV can at all times maintain adequate situational awareness with the USV in relation to direction the USV is facing and manoeuvre the USV safely.

The USV is to be fitted with suitable illumination to ensure visibility.

CREW MEMBER REQUIREMENTS

It is emphasized that ultimately the sole authority for the safety of the operation is the Operator in command who may cancel or terminate a sortie at any stage if he/she considers that it is not prudent to continue due to adverse weather or other factors affecting safety.

The Operator in command of a company USV carrying out might operations must:

- Have a qualification issued by an approved organisation or person and;
- Be experienced in night sea operations with at least 10 hours' night sea.

USV REQUIREMENTS

The limitations and requirement imposed by the particular USV Manual supplements shall be followed at all times.

CREW BRIEFING

The USV in command is ultimately responsible for the safety of the crew. Only essential crewmembers shall be involved with the operation of the USV and its equipment.

5.2 APPENDIX 2

List of Operations Manual Revisions.

Each Revision/ Amendment shall be placed chronologically behind this document.

Revision #	Page #	Date Effective	Description	Inputted by
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

5.3 APPENDIX 3

INDUCTION & TRAINING CHECK LIST

This check list is to be completed prior to a new or casual Operator commencing Line Operations the Chief Operator will complete the Check List and insert it in the Operator Records. The check list can also be used for renewal or refresher training for specific items.

- Ratings and type endorsements,
- Annual Check – If new Operator then the check to line will cover this item

INDUCTION CHECK LIST

This checklist provides a series of steps that all new employees are to be taken through. The induction guide is laid out so that these sections follow one another. The Inducting Manager should tick off all the boxes during the induction process.

Section A	**Introduction to X-craft Enterprises Ltd**	
The Company		Business Philosophy
Regional Organisation Chart		Office Photos
Quality Management		Company Organisational Chart
Section B	**Terms and Conditions of Employment**	
Employment Agreement		Position Description
Superannuation		How pay is calculated
IR 330 Form		Payroll Form
Leave Provisions		Code of Conduct
Personal File		Privacy Act
Business Cards		Kiwi Saver
Payroll Procedure		Remuneration
Vision		Hours of Work
Security of Building		Allowances & Expenses
Section C	**Health and Safety**	
Health and Safety Expectations		Hazard Management
Accidents		The Accident Process
First Aid		Emergency Evacuation Procedures
Working in remote areas – Site Safe		Health & Safety Policy
Rehabilitation		PPE
OOS		
Section D	**Employee Welfare**	
Employee Assistance Programme		Harassment Policy

Work Group Manager

_____

_____

Date _____

Employee name

_____

_____

Employee Signature

_____

_____

Date _____

Topic	Inductor
Overview of USV Machine specifications Safety checks Re-fuelling procedures Daily maintenance, cleaning procedures	Chief Operator
Office/USV maintenance procedures Front office cleaning – as required Empty rubbish – as required Coffee Machine – (stocked with coffee/milk etc.) USV cleaned as required Hanger cleaning as required	Chief Operator
Client Care procedures Recording details of new clients Meeting & greeting clients Safety briefings Safety machine checks **Training Paperwork Procedures** Completion of client paperwork (pre and post operation) Record keeping and filing	Chief Operator

Policies and procedures

- Maintenance procedures
- Use of maintenance release reporting of defects
- Review of Operations Manual
- Procedures & responsibilities
- Daily Inspection, pre and post deployment Instruction
- Familiarisation with Company documentation
- 10 hours type training/currency training before deployment test
- Operation Check – The operation test document for the issue of manufacturers training will be conducted to assess a Operator's ability and readiness to be cleared to line.

Name of Operator _____	Signature _____
Chief Operator _____	Signature _____
USV type _____	Date _____

5.4 APPENDIX 4

USV LOG AND MAINTENANCE RECORD AND DEFECT RECTIFICATION SHEET

MAINTENANCE RECORD

Section 3 of this form- this is the back of the Technical Log listed on the previous page

5.6 **APPENDIX 5** Briefing

The following briefing is to be given by the controller to all crew members and observers. The controller is also responsible to ensure the emergency contact telephone numbers are to hand. Any additional requirements for this operation must be added

Action	✓
Overview of the mission as planned	
Any specific tasking for crew member. EG. person tasked with observing for people straying into the area of operation	
Possible issues and identification of hazards associated with the mission including planned action	
How the controller will communicate any problem and/or subsequent action	
Identification of alternate landing area	
Identification of a safe zone	
Identification of transit lane if required	
Identify First Aid assistant and who will contract emergency services if required.	
All mobile phones and transmitting devices other than those approved by Controller to be 30m away at all times.	
Controller not to be spoken to unless mission specific/ emergency	
Action following an incident	
Notes/comments specific to mission	
Emergency contact numbers	

5.7 APPENDIX 6 – Job Log Card

Company		Date	
Task	Location		
✓Sketch of area / Google Map screenshot	Maps and charts available and checked		
	Weather, within limits for machine and operation		
	Notification to mariners		
	Possibility of public moving into area		
	Right of way		
	Landing area including alternate		
	Ability to maintain 10M of public		
	Obstructions (reefs, rocks)		
	Possible interference (Jetties, anchored vessels, mooring buoys)		
	Ability to maintain visual line of sight		
	Controllers ability matches location/task		
	Permission of any private area owners		
	Privacy		
	Local restrictions, bylaws		
	Need for signage		
Operator		Signature	
Crew		Signature	

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APPENDIX 5.8 - WORK METHOD STATEMENT

WORK METHOD STATEMENT	
PROJECT ADDRESS:	**PROPOSED DATE OF OPERATION:**
PROJECT:	**PREPARED BY:**
JOB REF #:	**REVIEWED BY:**

POSSIBLE HAZARDS	SAFETY CONTROLS
Time	Job will only commence when conditions are favourable, Operator has final decision. Orientation of Operator facing away from sun.
Weather	Job will only commence when conditions are favourable, Operator has final decision.
	PPE as required
Emergency Landing	The Staging Area shall at all times remain clear in case of an emergency RTH activation.
Collision Scene	Should there be a crash, the scene is to be clear of all non-essential personnel. Support craft deployed to the scene. Fire extinguisher on hand for battery fire. Life jackets and VHF radio for communication taken to the scene. Company ASO to be contacted and follow procedures given.
Additional Comments/Recommendations:	

PERSONAL QUALIFICATIONS AND EXPERIENCE		*PERSONAL DUTIES AND RESPONSIBILITIES*	*TRAINING REQUIRED TO COMPLETE WORK*
CERTIFICATES / WORK COVER APPROVALS	**CODES OF PRACTISE, LEGISLATION**		
EQUIPMENT	**MAINTENANCE CHECKS**		
READ AND ACCEPTED AND SIGNED BY ALL PERSONAL INVOLVED			
NAME:	SIGNATURE:		
OPERATOR:			
CREW:			
CREW/ OBSERVER:			

RISKS	RISK RATING	RISK CONTROL MEASURES	WHO IS RESPONSIBLE	RESIDUAL RISK RATING
PRE JOB SITE INSPECTION				
General hazards; trip/ fall		PPE/ Footwear, High Vis Clothing	ALL PERSONAL	
Sunburn		Sunscreen/ long clothing		
Dehydration		Water bottles		
Getting lost – Large sites		Search and rescue plan		
		Travel together		
		SAR times		
		Locating equipment		
Suitability of staging area, proximity of buildings and 3rd party property		Ensure area large enough for size of USV and ensure operations at this site can be done so safely- obtain road closure approvals and MARITIME NEW ZEALAND approvals if needed	X-CRAFT	
Insufficient launching and landing area		Landing area to have 30 square metres of site area marked off	X-CRAFT	
Public		Notification to neighbours stating operation and requirements	X-CRAFT	
		Temporary fencing/crowd control	X-CRAFT	
PRE OPERATION – OPERATIONAL DAY				

Crew must be aware of their role		Crew allocated area to work in to reduce risk of intrusion by non-briefed personnel members	X-CRAFT	
Knowing protocols in emergency		Briefed on Emergency Plan	ALL PERSONAL	
Procedures and safety		All personnel briefed and sign off on work method statement	ALL PERSONAL	
Staging area		Flat and suitable	OPERATOR	
Staging area clear		Marked off with fencing, crowd control	OPERATOR	
Payload coming Loose		Ensure camera attachment integrity	ALL PERSONAL	

USV Unserviceable		Daily Inspection, Maintenance Release	OPERATOR	
Unfamiliar Crew		Site Induction carried out	OPERATOR	
Comms Unserviceable		Communications check at briefing	OPERATOR	
		Check ground to air communication before take off	OPERATOR	
Personnel not in position		Crew check via voice or radio prior to take off. No take off if not all in position	OPERATOR	
Ground station		Consider wind, sun, approach departure Paths, VLOS at all times	OPERATOR	
Public		Access to site controlled by personnel	X-CRAFT	
DURING SEA OPERATIONS				

Security		No loose Items before launching	OPERATOR	
USV not to be operated near people		All personnel cleared of transit path	OPERATOR	
Submerges debris		USV not to be navigated over submerged obstructions	ALL PERSONAL	
USV colliding with people		Crew to never position themselves between the USV and its staging area	ALL PERSONAL	
In sight of USV		Area clear, sun and shadows considered to maintain VLOS at all times	OPERATOR	
Loss of communication verbally		Enable home lock, land in staging area and re-establish communications before restart	OPERATOR	
Loss of control of USV		Enable RTH, allow USV to land, shutdown and fault find	OPERATOR	
Engine/ Mechanical Failure		USV Maintenance Release/ Daily Inspection carried out	OPERATOR	
		Ensure the emergency landing area is clear and transit area is clear at correct height for a RTH.	OPERATOR	
		Briefing for shore crew – stay still	OPERATOR	
		Operator to be aware of all obstacles	OPERATOR	

		Remain in contact with all crew- crewman and be in radio contact with the Operator at all times	OPERATOR	
Personnel distracted by mobile Phones		All non-essential electronic devices outside of 30m of Operator and all mobile phones not turned on during operations	ALL PERSONAL	
REFUELLING OF USV				
USV voltage low		Monitor on TX the voltage	OPERATOR	
Lipo damage		Cover with fire blanket	OPERATOR	
Quality		Batteries charged, kept cool and checked before usage, daily battery inspection carried out and number of charges recorded	OPERATOR	
ENVIRONMENTAL CONSIDERATIONS				
Noise pollution		Only operate within standard noise restriction time allocations	OPERATOR	
Complaints from public		Notify surrounding public prior to commencement of operation	OPERATOR	

Airborne particles dust etc.		Water HLA if possible	OPERATOR	
EXTRA CONSIDERATIONS – OPERATOR TO FILL OUT AS NECESSARY				

APPENDIX 5.9 – *HAZARD REGISTER*

TOTAL RISK COUNT / TOTAL RISK SCORE = FINAL RISK

OPERATION: ACCEPTED / REJECTED

(Circle one)