Australian Government
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ATSB SUPPLEMENTARY INVESTIGATION REPORT

Marine

Final

Inspection of five vessels owned by the Department of Immigration and Multicultural and Indigenous Affairs

28 November 2005

to

2 December 2005

Australian Government

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at Thursday Island

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Inspection of five vessels owned by the Department of Immigration and Multicultural and Indigenous Affairs at Thursday Island, 28 November to 2 December 2005.

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Acknowledgements

None

Abstract

This report is being released to supplement the ATSB final investigation report into the loss of *Malu Sara*, which was released on 19 May 2006.

In accordance with instructions received from the Commonwealth Department of Transport and Regional Services, Clipper Hull Surveyors attended five vessels at Thursday Island for the purposes of conducting inspections and testing. The specific instructions received were as follows:

- To conduct the surveying and testing of five sister vessels to the Department of Immigration and Indigenous affairs (DIMIA) vessel that was recently lost in the Torres Strait. The vessels are of plate aluminium construction, self draining deck, approx 6.6 metres length, centre console, with twin outboards mounted in a pod.
- To conduct a full flotation and practical stability test on at least one vessel, including a swamp test.
- To test weather tightness and water tightness of all vessels in accordance with appendix C of Australian Standard AS 1799.1 – 1992.
- To check the adequacy of deck drainage arrangements and the size of the freeing ports on all vessels in accordance with Australian Standard AS 1799.1 – 1992.
- To test the integrity of the fuel tanks and fuel system.
- To supply the Australian Transport Safety Bureau (ATSB) with a report outlining the findings.

1 BACKGROUND

This report is being released to supplement the ATSB final investigation report into the loss of *Malu Sara*, which was released on 19 May 2006.

1.1 We are advised that the Commonwealth Department of Immigration and Multicultural and Indigenous Affairs (DIMIA) is the owner of a number of small vessels based in the Torres Straits.

1.2 These vessels (six in number) were sister vessels that were built for and supplied to the Department in 2005.

1.3 We are advised that there were certain contractual requirements imposed on the builder by the Department. The relevant requirements included the following:

- Certificate of construction to USL Class 2C
- Certificate of positive flotation
- Compliance with AS 1799
- Compliance with Qld Regulations.
- Capability of being registered in Qld as a commercial ship under 6 metres.
- Vessels to be under 6 metres LOA.

1.4 One of the vessels was reported missing in October 2005.

1.5 The remaining vessels (five in number) were subsequently relocated to Thursday Island for inspection.

1.6 We attended the vessels in Thursday Island between 28/11/05 and 03/12/05.

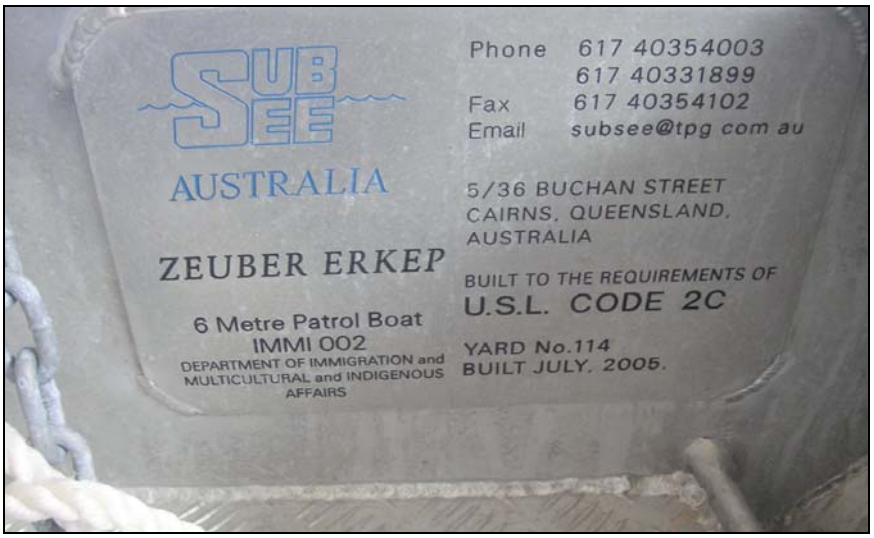
1.7 We found the vessels secured on their road trailers ashore in a locked shed and conducted a preliminary inspection of them with the following results:

Vessel Hull #	Vessel Name	Comment
IMMI 001	*Kuzi*	Motors fitted, appears operational
IMMI 002	*Zeuber Erkep*	No motors fitted
IMMI 004	*Kang*	Motors fitted, appears operational
IMMI 005	*Magani Guthat*	Motors fitted, appears operational
IMMI 006	*Ngagalayg*	Motors fitted, appears operational

1.8 We understand the vessel reported missing was IMMI 003 (*Malu Sara*).

1.9 Each vessel was found to be fitted with a builder's plate stating the vessel's name and hull number and stating '6 metre patrol vessel' and 'Built to the requirements of USL Code 2C'.

Figure 1: Example of a builder's plate



1.10 The vessels inspected were constructed from welded aluminium plate generally in accordance with the builders general arrangement drawing SA 1446-01 (Attachment #1) and Lines Plan (Attachment #2).

1.11 The vessels have a single main void space below the main weather deck. This void space extends forward and is common with the space below a raised foredeck. This void space is also common with an outboard motor well formed into the after most part of the vessel

1.12 This single void space appears intended to provide reserve buoyancy and is shown in a diagram on a Positive Flotation Statement (attachment #3) provided by the builder dated 16/05/05 as being the location and area of 'buoyant material'.

1.13 This void space also has a separate fuel tank void recessed into it below the aft end of the deck. (The fuel tank volume does not appear to have been taken into account in the calculation for the volume of buoyancy provided by the main void which is a part of the Positive Flotation Statement.)

1.14 The vessels were each found to be fitted with a centre console steering and control station and twin Mercury 90 hp outboard motors (2005 Model 90ELPTOSW – Maximum rpm 5500 – Weight 139 kg each).

1.15 We then proceeded by measuring and inspecting one of the remaining vessels (IMMI 002 *Zeuber Erkep*) and subsequently inspecting the other vessels to determine any significant differences.

1.16 We found the following vessels to be of similar dimensions and construction:

IMMI 002	*Zeuber Erkep*
IMMI 004	*Kang*
IMMI 005	*Magani Guthat*
IMMI 006	*Ngagalayg*

1.17 We found some differences between these vessels and the fifth remaining vessel IMMI 001 *Kuzi*.

1.18 We found this vessel (IMMI 001 *Kuzi*) to have the following differences to the other four remaining vessels:

1 Different vee section and deeper design to the outboard motor well than on the other 4 vessels.

2 Smaller diameter anchor well drain than the other vessels.

3 Anchor well drain routed from starboard side of well to port side hull outlet – on the other vessels this drain runs from the port side of the anchor well to the port side of the hull.

4 Main void drain bung offset from centreline – other vessels drain is on centreline.

5 We considered the general standard of welding of the *Kuzi* to be superior to that of the other vessels.

1.19 We were advised that *Kuzi* was the first vessel built and that it entered service for a period of trials before the remaining vessels were constructed and that the remaining vessels all incorporated some relatively minor modifications resulting from the trials of the *Kuzi*.

1.20 We were also advised that the *Kuzi* had been extensively re-welded on Thursday Island after delivery and that the remaining vessels had not been similarly re-welded.

1.21 Under these circumstances we suggest that the missing vessel (IMMI 003 *Malu Sara*) was in all probability an identical (or almost identical) sister vessel to hull numbers IMMI 002/004/005/006 and that it resembled those vessels more closely than IMMI 001 *Kuzi*.

2 SEA TRIALS

2.1 We considered a sea trial to be appropriate in order to meet the more general requirements of our instructions to survey and test the subject vessels.

2.2 The relevant vessels available for sea trials were the vessels IMMI 004/005/006. (IMMI 002 could not be used for sea trials as it had no engines fitted and IMMI 001 was eliminated because of the likelihood of differences between her and the missing vessel as detailed above).

2.3 We selected IMMI 004 *Kang* for the purposes of conducting sea trials. The vessel appeared to be operational and typical of the remaining group of vessels.

2.4 *Kang* was launched by trailer and sea trials were conducted on the afternoon of 29/11/05.

Figure 2: Launching vessel

2.5 For the purposes of the sea trial, the vessels fuel tanks were partially full (gauges defective) and 5 persons were on board including representatives from DIMIA, the Australian Maritime Safety Authority (AMSA), and the Australian Transport Safety Bureau (ATSB).

2.6 The single main hull void was confirmed empty by removing and then replacing the transom bung with the vessel trimmed aft before the vessel was launched for the sea trial.

2.7 The total weight of persons on board for the sea trial was 503 kg with approximately 50 kg of safety items, spare fuel, and equipment also on board.

2.8 The sea trial was conducted inshore in light winds with a slight sea. A portable GPS was carried.

2.9 The vessel achieved a planing attitude at a speed of about 12 knots on both engines.

2.10 At 4200 rpm a speed of 24 knots was obtained and at 5200 rpm a speed of 35 knots was obtained (operating on both engines).

Figure 3: View astern of vessel at full speed

2.11 On one engine only a speed of 19 knots was obtained at 4300 rpm.

2.12 The vessel was found to perform and handle reasonably well when operating ahead and under powered turns under these conditions. The vessel did not ship any water other than a small amount of light spray.

2.13 A trial was conducted with the vessel operating astern at low to moderate power using both engines.

2.14 Under these circumstances the vessel took water over the motor transom into the motor well and the vessel exhibited alarming tendencies to bury her stern.

2.15 The astern trial was discontinued to avoid submerging the motors which would have been inevitable within a matter of seconds had it been continued.

2.16 Those on board were of the view that the vessel would in fact have buried its stern and flooded completely had the astern trial been continued.

Figure 4: Stern motor well flooding

2.17 At the time of the astern trial there was a noticeable free surface effect from the water which came into the motor well (estimated at 325 litres) and which was detrimental to the vessel's stability under those conditions.

Figure 5: Water in the motor well

2.18 The water in the motor well took a considerable time to drain when the vessel was under way at operating speeds and at low speed the well appeared not to drain at all as the external water level was higher than the single transom freeing port provided.

Figure 6: Water draining from the motor well

2.19 On return to the shore at the completion of the sea trial, the vessel was removed onto her road trailer.

2.20 During the course of the sea trial the vessel had been afloat for 74 minutes and under way for 54 minutes.

2.21 The main void bung was then opened with the vessel trimmed by the stern and a significant quantity of water, estimated at 20 to 40 litres, was drained from the void which had been empty before launching.

Figure 7: Water draining from the void

2.22 The vessel was then subjected to a flooding test across the deck (refer to paragraphs 3.3 and 3.4) and water again found to ingress the hull void through the deck thus proving the lack of watertight integrity of the void space on this vessel.

Figure 8: Cockpit deck covered with water during the test

Figure 9: Water draining from the void after the test

3 WEATHER TIGHTNESS / WATER TIGHTNESS

3.1 Our instructions in this regard referred to the specified tests for water tightness and weather tightness provided in Appendix C of the Australian Standard - Small Pleasure Vessels Code AS 1799.1.

3.2 However, it became apparent that the design and type of vessel was such that the relevant issue was to establish the watertight integrity (or otherwise) of the main deck/void tank top and our instructions were amended on site accordingly.

3.3 In order to establish the extent of watertight integrity vessels numbered IMMI 001/004/005/006 were subjected to a testing process. Vessel IMMI 004 underwent this process on 29/11/05 after the sea trail was completed with the results described in paragraph 2.22 above. Vessels 001/005/006 were tested subsequently.

3.4 Vessel IMMI 002 was not subjected to this test at the same time as it was selected as the vessel to be used for a practical stability and swamp test the following day (as it had no outboard motors fitted) which would include a similar test.

3.5 The testing process conducted on IMMI 001/004/005/006 was attended and witnessed by representatives of ATSB and AMSA and was carried out by the following method:

1 Main void inspected and checked dry, vessel trimmed aft and bung removed to ensure drained.

2 Main void bung replaced and vessel trimmed level.

3 Freeing port to motor well blocked off.

4 Water added to weather deck by hose to a maximum depth of approximately 50 mm over a period of about 30 minutes.

5 Water also added to anchor well by hose.

6 Vessel then trimmed aft and freeing port opened to drain deck.

7 Once deck drained the void bung was removed and the void was checked for any ingress of water from deck.

3.6 A photographic record was kept of each vessel tested.

3.7 We believe that this process would reasonably simulate the ingress of water to the deck of the vessel from wave action or heavy rainwater.

3.8 The results of these tests were as follows:

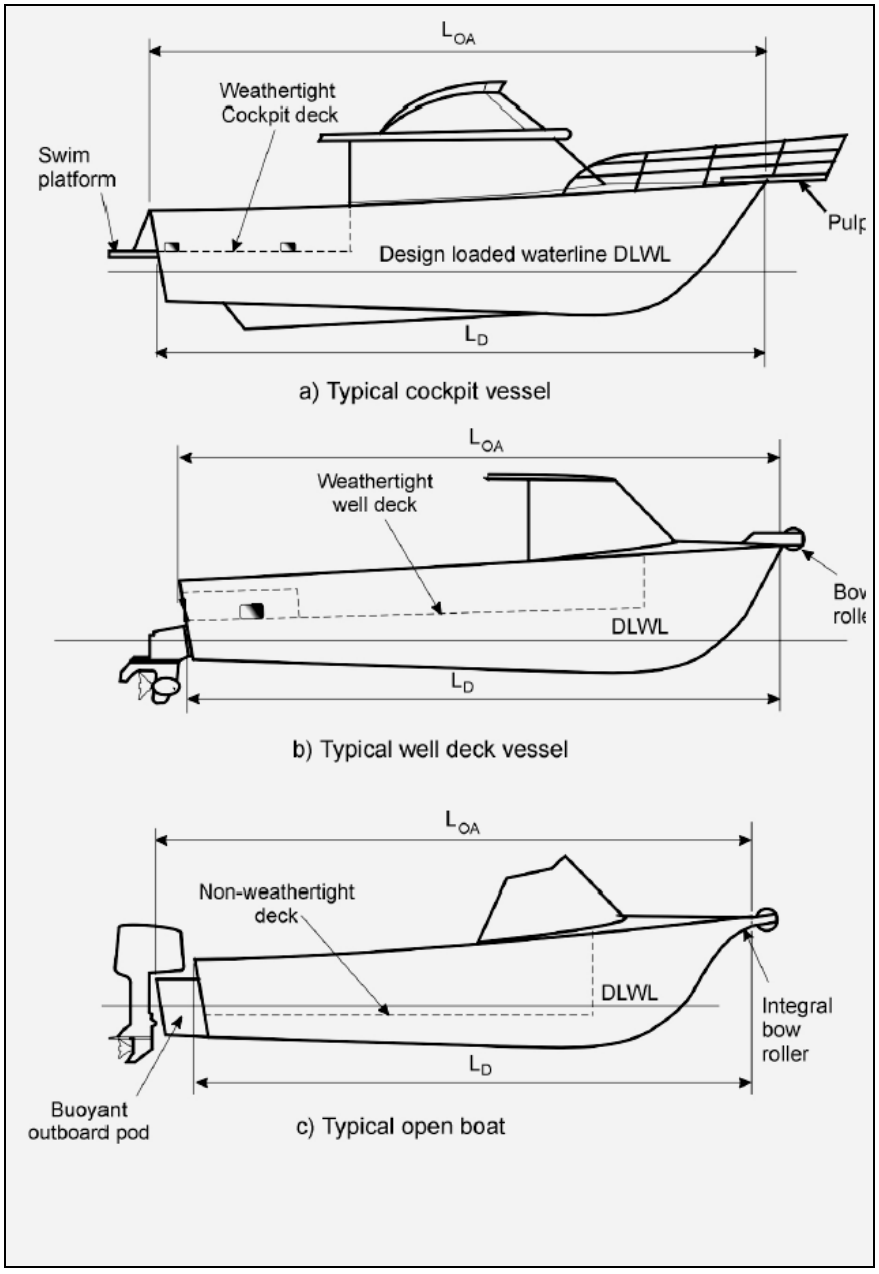
Vessel Hull #	Vessel Name	Comment
IMMI 001	*Kuzi*	No water found in void when bung removed. Anchor well did not drain.
IMMI 004	*Kang*	10-20 litres of water drained from void when bung removed. Anchor well drained freely.
IMMI 005	*Magani Guthat*	10-20 litres of water drained from void when bung removed. Anchor well drained freely.
IMMI 006	*Ngagalayg*	10-20 litres of water drained from void when bung removed. Anchor well drained freely.

4 ADEQUACY OF DECK DRAINAGE

4.1 Our instructions were to check the adequacy of deck drainage arrangements and the size of freeing ports on all vessels in accordance with Australian Standard AS 1799.1 – 1992.

4.2 The relevant section of the Standard is S 3.8 which refers to vessels where bulwarks on weather decks form wells or where cockpits are employed. It is clear from the builders Positive Flotation Statement for the missing vessel that the main deck was intended to be a weathertight well deck and that the vessel was, to all intents and purposes, a typical well deck vessel (refer NSCV Part B Figure A3 reproduced below for clarification of this term).

Figure 10: Example of overall length measurement



4.3 Each of the remaining vessels was found to be provided with scuppers (as defined in AS 1799.1 s 1.3.38) from the main transom deck port and starboard to the motor well weather deck.

4.4 The motor well of each vessel was found to be provided with a single freeing port (as defined in AS 1799.1) on the centreline of the motor well weather deck.

4.5 All of these freeing ports/scuppers on all vessels were seen to be fitted with external flexible synthetic flaps.

4.6 The intended arrangement therefore appears to be that any water shipped onto the main weather deck would drain first to the motor well via the scuppers and then overboard via the freeing port in the motor well transom.

4.7 In the vessel IMMI 001 the main deck drains are each 54 mm diameter (x 2). In the other 4 vessels the drains are 45 mm diameter (x 2).

Figure 11: Scupper

4.8 The transom freeing ports are in all cases rectangular openings with radiused corners.

Figure 12: Transom freeing port

4.9 The maximum dimensions of these openings vary between the vessels as follows:

Vessel Hull #	Vessel Name	Dimension
IMMI 001	*Kuzi*	112 mm x 55 mm
IMMI 002	*Zeuber Erkep*	155 mm x 53 mm
IMMI 004	*Kang*	112 mm x 55 mm
IMMI 005	*Magani Guthat*	112 mm x 55 mm
IMMI 006	*Ngagalayg*	112 mm x 65 mm

4.10 The scupper area provided for the first stage of drainage (i.e. into the motor well from the main deck) on vessel 001 is 2290 mm^2 each side and on the other vessels is 1590 sq. mm. on each side.

4.11 The freeing port area provided for the second stage of drainage from the motor well through the single freeing port to the sea varies between about 6160 mm^2 and 8215 mm^2.

4.12 The Australian Standard 1799.1 (s 3.8.2) specifies minimum specifications for scuppers according to a formula. (i.e. minimum area each scupper to be 800 mm^2 and total effective area to be no less than 700 mm^2 per square metre of cockpit).

4.13 In the case of these vessels, the cockpit area is estimated at no less than 8 m^2 after estimating deductions for excluded areas of lockers/compartments.

4.14 The minimum required total effective area of all scuppers under AS 1799.1 is therefore (8 x 700) = 5600 mm^2.

4.15 The actual area provided is between 4580 mm^2 (2 x 54 mm diameter = 2 x 2290 mm^2) on vessel #001 and 3180 mm^2 (2 x 45 mm diameter = 2 x 1590 mm^2) on the other 4 vessels inspected.

4.16 Therefore, the scupper area provided is between 57% (Vessels 002/004/005/006) and 82% (vessel 001) of the required area. These calculations make no allowance for the restriction of flow which was evident resulting from the builder's provision of the external flaps to the scuppers.

4.17 As stated above the design intention appears to have been that the second stage of drainage from the motor well deck should be via a single freeing port in the motor well transom.

4.18 The Australian Standard requires freeing ports to be provided on each side for each well – a single centreline freeing port is not considered sufficient.

4.19 In the case of these vessels, the volume of the motor well is such that the single freeing port provided is technically (as per the Australian Standard) more than adequate in terms of its area for the draining of this well alone.

4.20 However, this freeing port is demonstrably inadequate in its ability to drain the motor well plus the volume of water which would flow into the well from the main deck via the scuppers if they were of an adequate and unrestricted area.

4.21 As indicated above, we believe that in all installations on all five vessels the external flaps fitted to the scuppers and freeing ports were of a design and construction which would restrict the draining of water overboard and limit the effectiveness of those scuppers and freeing ports.

5 FUEL TANKS AND SYSTEMS

5.1 Our instructions required the testing of the fuel tanks and the fuel systems.

5.2 We inspected fuel tanks and fuel systems on all vessels and found them similar.

5.2 The fuel tank arrangement appeared to be in accordance with the builder's General Arrangement drawing comprising one fuel tank divided into 2 sections (each approximately 150 litres) located beneath the main deck on the centreline aft.

5.3 The tank was found to be constructed as a separate welded aluminium module with the top of the tank forming the cockpit deck with the tank installed.

5.4 The tank was installed into a void space recessed into the cockpit deck.

5.5 The tank had a flange around its upper edge which rested on the top of the tank void and this flange (which was sealed with mastic) was required to support the weight of the tank and contents as the bottom of the tank itself did not touch the bottom of the tank void.

5.6 The tank occupied almost the entire tank void except for a small space at the aft end.

Figure 13: Void space and fuel tank

5.7 The tank void was provided with a gooseneck type breather mounted outside the transom on the port side aft and a fume detector sensor was also fitted to the void on the starboard side aft with a wire connection via a cable conduit to the console where an audible alarm unit was fitted.

5.8 Each section of the tank was provided with a combined filler/breather, a suction line, and a fuel gauge.

5.9 The filler, breather, and suction lines were attached to welded alloy up-stands at the aft end of each tank. The fuel gauge was flush mounted (directly onto the chequer plate tank top).

Figure 14: Top of fuel tank with hoses leading from up-stands

5.10 We removed fuel gauges from each vessel and, in every case, found them to be reading quantities significantly inconsistent with the actual level in the tank.

Figure 15: Removal of a fuel gauge

5.11 Each suction line was also provided with a remote fuel filter/water trap mounted on the after part of the transom.

5.12 In order to further assess the fuel tank arrangements one tank was removed entirely from a vessel (IMMI 002 *Zeuber Erkep*). This activity was witnessed by representatives of ATSB and AMSA.

5.13 This tank had been previously filled with water and one section was observed to loose liquid overnight.

5.14 After removal, the tank was not formally pressure tested but was simply filled with water and was immediately found to leak.

Figure 16: Water leaking from the fuel tank during testing

5.15 The fuel tank was therefore not able to withstand the ordinary pressure of the liquid within it even under static conditions.

5.16 The fume detectors were also examined. In every vessel the alarm unit at the console had been disconnected from the wiring to the sensor.

Figure 17: Back face of fume detector

5.17 In the vessel where the fuel tank was removed the sensor was found to be badly corroded from the presence of seawater in the void where it had been mounted and it would not, therefore, have operated even had it been connected.

6 PRACTICAL STABILITY AND SWAMP TEST

6.1 We conducted a practical stability and swamp test of one vessel (IMMI 002 *Zeuber Erkep*) on 01/12/05.

6.2 This was attended and witnessed by representatives of ATSB, AMSA, and DIMIA.

6.3 The location chosen for this activity was a sheltered position adjacent to a breakwater and vessel ramp.

6.4 The subject vessel was secured bow into the ramp with its stern to seaward and an anchor on each quarter.

6.5 The vessel was secured aft by a bridle arrangement in such a manner that it was free to heel without impediment.

Figure 18: Vessel secured and ready for testing

6.6 The conditions at the time were reasonable with a 15 to 18 knot wind from the port beam (from which the hull was sheltered by the breakwater) and a very slight sea from aft.

6.7 The stability test and the swamp test were conducted in accordance with Guidance Notes issued by Maritime Safety Queensland for ships under 6 metres. (Refer attachment #4).

6.8 The stability test was conducted first.

6.9 Before the vessel was launched, concrete and sand weights totalling 278 kg (the weight of the motors at 2 x 139 kg) were secured into the motor well. The fuel tanks were filled with water. The main hull void was drained by the transom bung, ensured dry, and the bung replaced. The scupper flaps and the transom freeing port flap were ensured free and open.

6.10 For this purpose, the vessel was considered to be a six person vessel (this was apparently the Owners design requirement although not stated on the builder's plate).

6.11 The test was intended to establish the condition of the vessel with the motors (or weights) fitted and with the placement of persons (or weight) as follows:

Amidships	2 persons	150 kg
Close to gunwale	4 persons	300 kg

6.11 In order to simulate the weight of persons, sandbags weighing 120 kg were placed into the forward console locker on the centreline and a further sandbag with a weight of 40 kg was placed on the centreline at the helm station. 2 x 40 kg sandbags were placed in the port side locker aft close to the gunwale and 2 persons weighing a total of 210 kg then moved to the port side gunwale.

6.12 This arrangement provided (in addition to the weight of the motors) 160 kg (i.e. a little over the weight of two persons) on the centreline and 290 kg (a little under the weight of 4 persons) close to the gunwale.

6.13 In this condition, the lowest freeboard was measured at approximately 430 mm which was well in excess of the minimum requirement of 75 mm and the stability test was therefore discontinued without altering any further weight distribution.

Figure 19: Measuring the vessel's freeboard

6.14 The swamp test was then conducted.

6.15 For this purpose an additional 60 kg of weight (sandbags) were added to the vessel with the weight distributed evenly to simulate the normal placement of persons and gear.

6.16 The total weight required for the vessel to pass the swamp test was the weight of the motors (278 kg), the weight of 6 persons x 75 kg plus 6 persons x 15 kg equipment i.e. a total of 818 kg.

6.17 The test was commenced with an all up weight as follows (i.e. 30 kg less than the requirement) with additional weights available:

Motor well	278 kg
Forward locker	120 kg
Console	40 kg
Aft area	140 kg
2 Persons	210 kg
TOTAL	788 kg

6.18 For the purposes of the test, a portable fire hose was used to commence filling the vessel with water.

6.19 In order to pass the test the vessel should first be filled with water until the water inside the vessel is level with the surrounding area.

6.20 In this case, the water was progressively added by the fire hose at a reasonably slow rate, commencing at 1145.

6.21 The vessel soon exhibited unstable characteristics and the two persons on board were observed to have difficulty maintaining the vessels stability by use of their body weight.

Figure 20: The vessel showing signs of instability

6.22 At 1153, the vessel took a significant list to starboard and submerged the gunwale. The 2 persons moved to the port gunwale to try and keep the vessel from capsizing.

Figure 21: Vessel listing to starboard

6.23 At 1156, the vessel capsized to starboard and inverted.

Figure 22: Vessel capsizing

6.24 The vessel remained afloat inverted and was obviously supported for a time by entrapped air.

Figure 23: Vessel floating inverted

6.25 The vessel was then righted and returned to its road trailer.

6.26 The transom bung was removed and a significant quantity of water (estimated 200 litres) was drained from the main void thereby proving again the lack or watertight integrity of this void.

Figure 24: Water draining from void

7 CONCLUSIONS

7.1 The vessels 002/004/005/006 were all found to have areas of poor quality welding.

7.2 The vessels 002/004/005/006 were all found to have significant leaks between the deck and the void space below and it was proven by practical test to each vessel that there was no watertight integrity to the void space thus rendering the void space ineffective as a means of reserve buoyancy and non compliance with AS 1799 – s 3.2.1 – 'Weather decks shall be watertight'.

7.3 All five vessels were found to have inadequate/insufficient deck drainage arrangements to free the well of water.

7.4 Vessel IMMI 002 was found to have a leaking fuel tank. The fuel tank was poorly designed, supported, and constructed. The other vessels are likely to be similar.

7.5 All vessels were found to have unreliable/inaccurate fuel gauges.

7.6 All vessels were found to have fuel void fume detectors disconnected.

7.7 All vessels were found to have unsealed penetrations to the fuel tank voids (i.e. fume detector cables).

7.8 All vessels were found to have builder's plates but these were not compliant with the requirements of AS 1799.1 i.e. they did not state the maximum power of motor to be fitted nor the maximum number of persons to be carried.

7.9 One vessel IMMI 002, was proven non-compliant with the reserve buoyancy requirements of AS 1799 s 2.4. The other vessels are all believed to be similarly deficient.

7.9 With respect to the contractual/documentary requirements we have been made aware of, we advise as follows:

- **Certificate of construction to USL Class 2C**

  We are not aware if this has been provided but this is outside the scope of our instructions.

- **Certificate of positive flotation**

  We have been provided with a copy of a certificate being a generic Positive Flotation Statement (attachment #3) issued in accordance with the provisions of the Transport Operations (Marine Safety) Act 1994 (QLD) and Regulations 2004 (s 66) with respect to the missing vessel *Malu Sara*.

  In this statement, the builder declares that the subject vessel 'is able, when filled with water, to remain afloat in an upright position while carrying its normal operational equipment and the total number of persons recorded in this statement' (i.e. 6).

  If the *Malu Sara* (the missing vessel) was indeed a sister to the other vessels and in particular the *Zeuber Erkep* we believe the

results of the swamp test conducted on 01/12/05 and detailed above show conclusively that this statement is not correct.

The Positive Flotation Statement for *Malu Sara* also includes a diagram indicating that the main hull void including the focsle and the motor pod contains buoyant material. As far as these spaces have been able to be inspected on all 5 remaining vessels there does not appear to be any buoyant material whatsoever therein.

- **Compliance with AS 1799**

  As detailed above the remaining vessels clearly exhibit a number of areas of non compliance with AS 1799.

  Specifically, in our opinion the vessels do not comply with the following sections

S 1.4	Marking
S 2.4	Reserve buoyancy
S 3.2.1	Weather decks to be watertight
S 3.8.1	Weather decks to be provided with sufficient scuppers or freeing ports
S 3.8.2	Scuppers to have minimum areas

- **Compliance with Qld Regulations**.

  Maritime Safety Queensland (MSQ) publish a guide to assist with the construction of a commercial ship for operations in Qld waters and the process by which ships under 6 m in length can be commercially registered.

  This guide suggests that vessels should be constructed to a recognised standard such as the USL Code, AS 1799, or a performance based approach as Queensland has no specific set of construction rules for a vessel of this size and type.

  With respect to the requirements for internal buoyancy and stability under the Queensland legislation, a ship under 6 metres in length can only be registered for class 2C service in Queensland if documentation is provided to satisfy MSQ that it the vessel has positive flotation and is suitable for its intended service.

  The requirements also state that the documentation should confirm compliance with the buoyancy and stability requirements of AS 1799 or the American Vessel and Yacht Council or s 10 Appendix N of the USL Code.

  It is also stated that the documentation should confirm compliance with the swamp and stability test as detailed in brochure ‘Guide for Conducting a Swamp and Stability Test for Ships under 6 metres’.

  In other words, a swamp test should be conducted. However the relevant provision also states that ‘Where a vessel cannot be swamp tested, calculations and a statement attesting to the sufficiency should be submitted by an accredited designer or surveyor’. We are

not aware of any basis on which a swamp test 'cannot' be carried out, particularly with respect to the subject vessels.

Nevertheless, the Positive Flotation Statement provided by the builder requires the builder (in the absence of a swamp test result) to nominate a recognised standard and provide complete calculations to confirm the basis on which the Positive Flotation Statement is made.

Although some calculations are attached to the statement there is no recognised standard nominated and the diagram attached to the statement showing buoyant material is in fact referring to a chamber intended simply to be airtight (which in the vessels tested it is not). In any event the use of a single airtight void to provide buoyancy is not compliant with the AS 1799. (refer s 2.4.4.)

- **Capability of being registered in Qld as a commercial ship under 6 metres**

  For these purposes, the length of a ship is determined by the greater of the following (per MSQ Guidance notes for measurement of commercial ships):

  'The distance from the fore part of the hull to the after part of the hull, measured at the upper side of the uppermost weather tight deck or, in the case of an open vessel, at the height of the gunwale,

  or

  96% of the distance between a vertical line passing through a point being the foremost part of the hull and a vertical line passing through a point being the aftermost part of the hull, excluding appendages,

  whichever is the greater'.

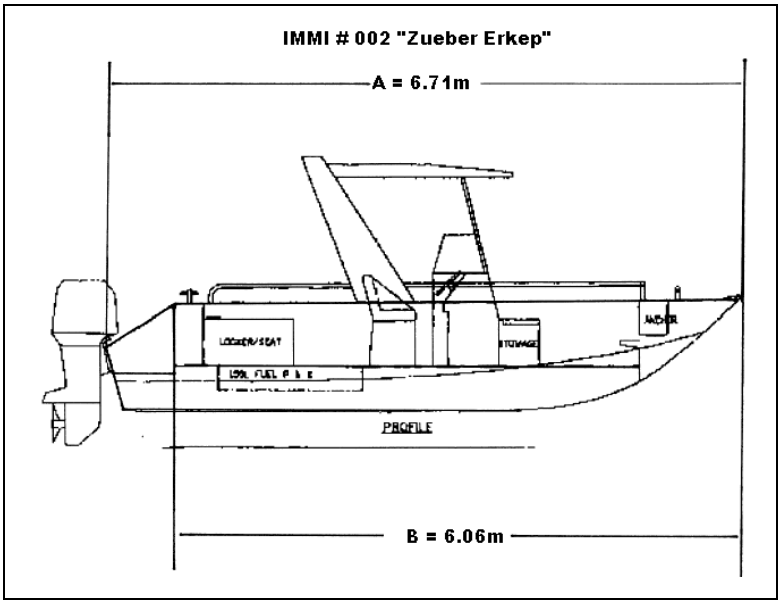
  We have measured the vessel IMMI 002 *Zeuber Erkep* (which is similar to the other 4 remaining vessels in this respect) using the most favourable interpretations of measured length (i.e. those which would give the lesser dimensions).

  The measurement from the fore part of the hull to the after part of the hull (i.e. the after lower part of the stepped transom) is 6.06m.

  The measurement from the foremost part of the hull to the aftermost part of the hull is 6.71m. 96% of that length is 6.44m.

  The measured length of the vessel is therefore 6.44m.

Figure 25: ***Zeuber Erkep*'s length measurements**



Note that we consider the fore part of the hull and the foremost part of the hull to be the same for practical purposes in this instance.

Given that the length of the vessel is greater than 6.0 m, the vessel would require certificates of compliance for design, survey, stability, and safety equipment.

- **Vessels to be under 6 metres LOA**.

As indicated above, the measured length of the vessel is 6.44m LOA.

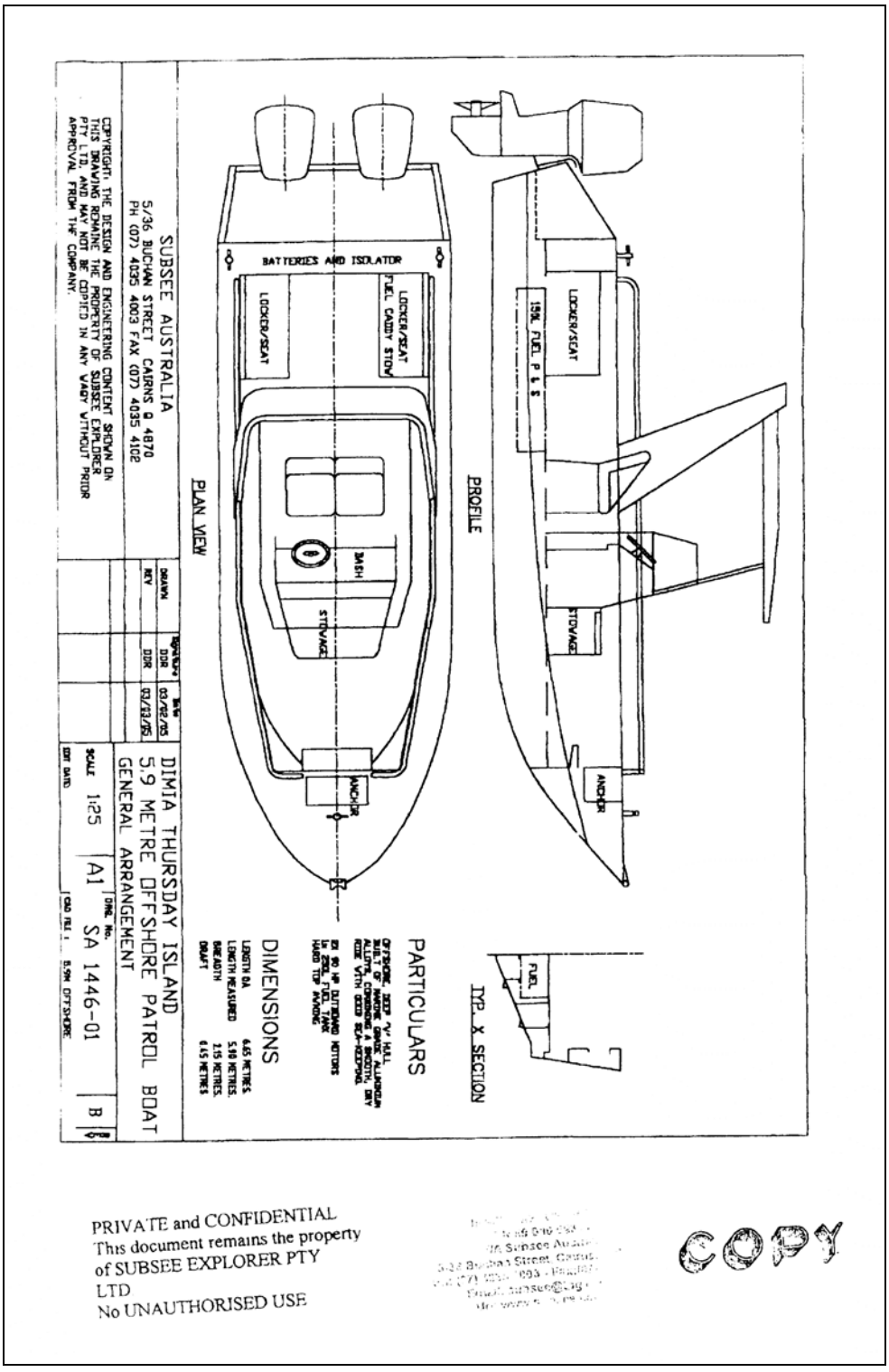
We note that the builder states in his documentation that the length of the vessel is 5.90m. We have measured 5.90m from the foremost part of the vessel and confirm that this is significantly short of the actual length:

Figure 26: **Aft gunwale of vessel IMMI 002**

Figure 27: Aft gunwale of vessel IMMI 002

8 APPENDICES

8.1 Builder's general arrangement drawing



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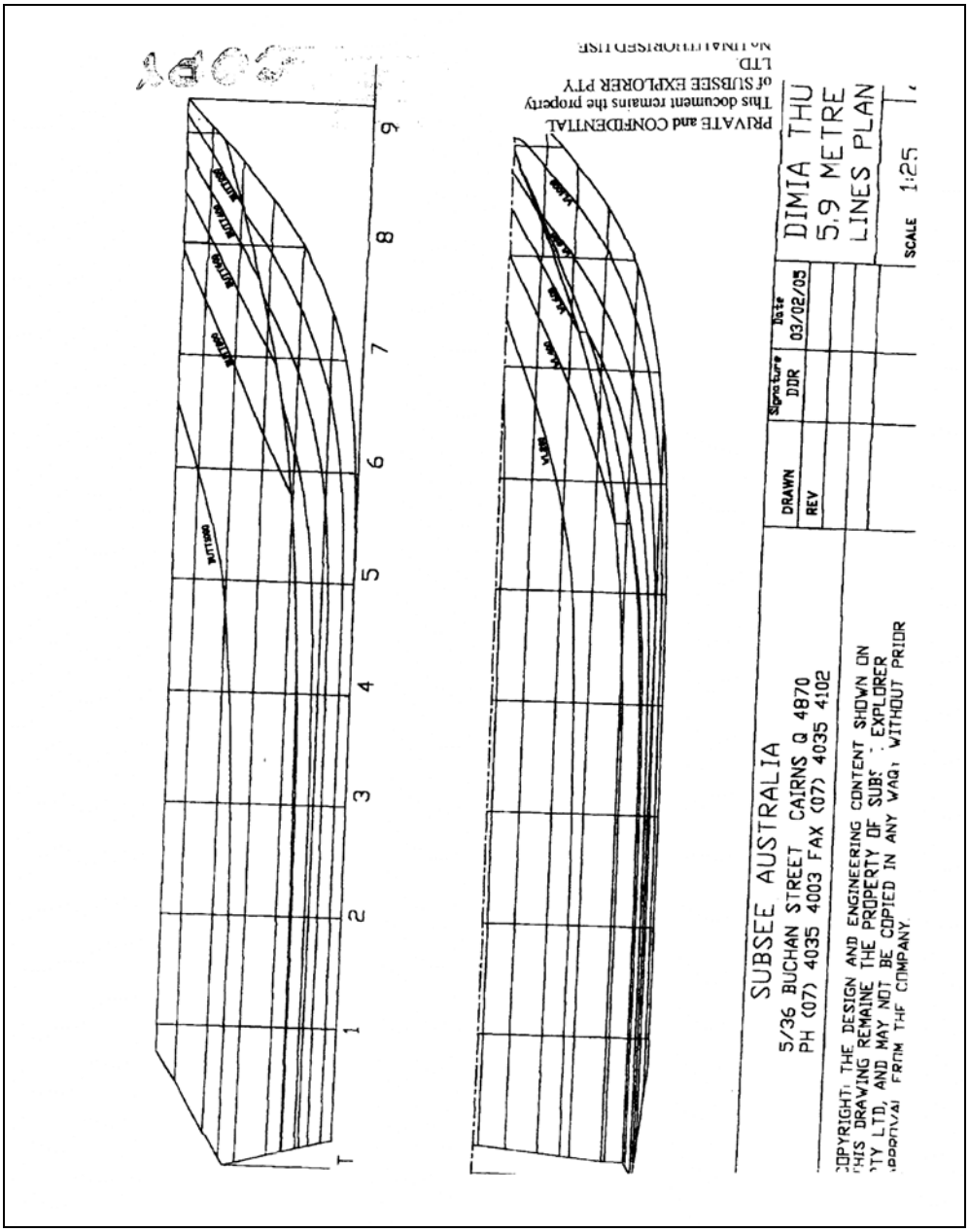
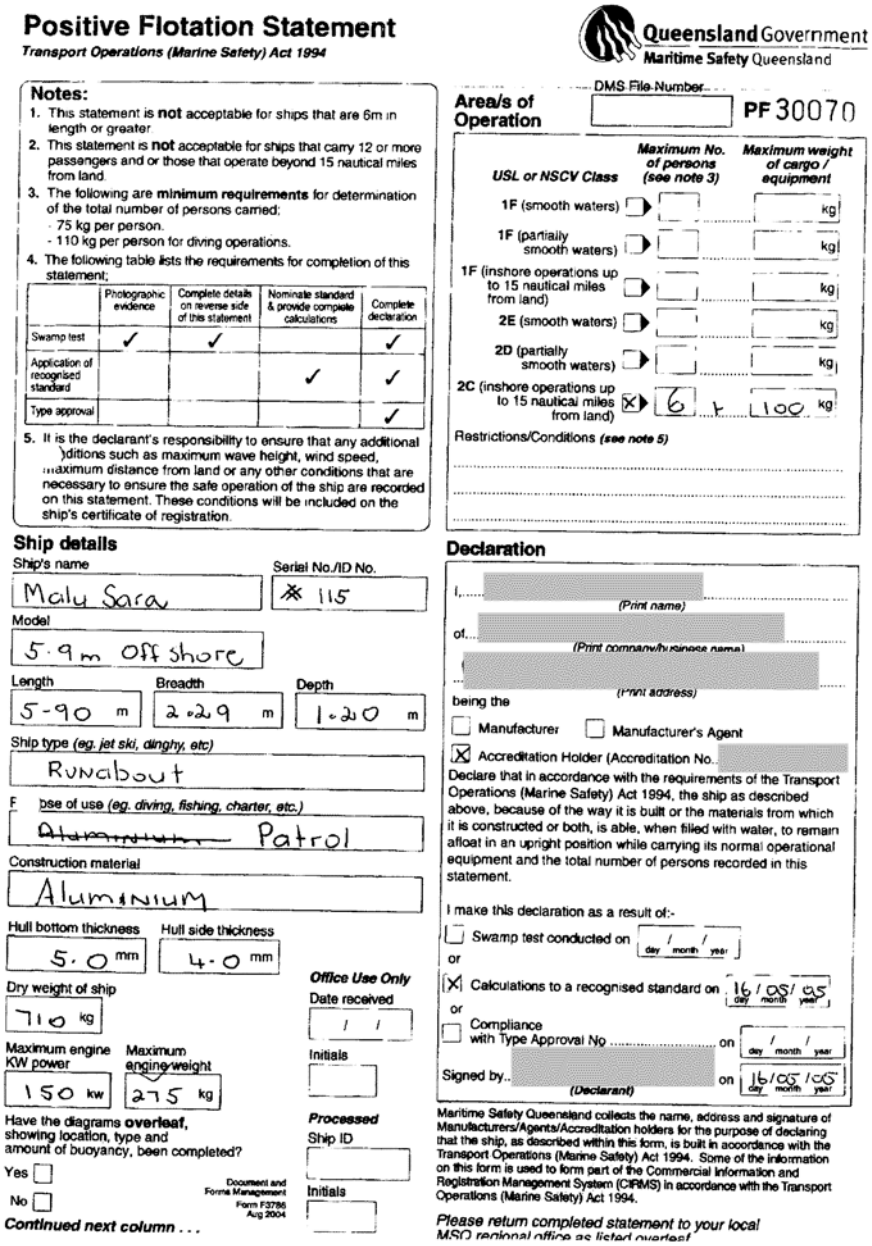
8.2 Builder's lines plan



8.3 Positive flotation statement (*Malu Sara*)



Positive Flotation Statement

Transport Operations (Marine Safety) Act 1994

Queensland Government
Maritime Safety Queensland

Notes:

1. This statement is **not** acceptable for ships that are 6m in length or greater.
2. This statement is **not** acceptable for ships that carry 12 or more passengers and or those that operate beyond 15 nautical miles from land.
3. The following are **minimum requirements** for determination of the total number of persons carried:
   - 75 kg per person.
   - 110 kg per person for diving operations.
4. The following table lists the requirements for completion of this statement:

	Photographic evidence	Complete details on reverse side of this statement	Nominate standard & provide complete calculations	Complete declaration
Swamp test	✓	✓		✓
Application of recognised standard			✓	✓
Type approval				✓

5. It is the declarant's responsibility to ensure that any additional conditions such as maximum wave height, wind speed, maximum distance from land or any other conditions that are necessary to ensure the safe operation of the ship are recorded on this statement. These conditions will be included on the ship's certificate of registration.

DMS File Number PF 30070

Area/s of Operation

USL or NSCV Class	Maximum No. of persons (see note 3)	Maximum weight of cargo / equipment
1F (smooth waters) ☐		kg
1F (partially smooth waters) ☐		kg
1F (inshore operations up to 15 nautical miles from land) ☐		kg
2E (smooth waters) ☐		kg
2D (partially smooth waters) ☐		kg
2C (inshore operations up to 15 nautical miles from land) ☒	6	100 kg

Restrictions/Conditions *(see note 5)*

Ship details

Ship's name: Malu Sara
Serial No./ID No.: ✱ 115
Model: 5.9m Off shore
Length: 5.90 m
Breadth: 2.29 m
Depth: 1.20 m
Ship type *(eg. jet ski, dinghy, etc)*: Runabout
Purpose of use *(eg. diving, fishing, charter, etc.)*: ~~Aluminium~~ Patrol
Construction material: Aluminium
Hull bottom thickness: 5.0 mm
Hull side thickness: 4.0 mm
Dry weight of ship: 710 kg
Maximum engine KW power: 150 kw
Maximum engine weight: 275 kg

Have the diagrams **overleaf**, showing location, type and amount of buoyancy, been completed?
Yes ☐
No ☐

Continued next column . . .

Office Use Only
Date received: / /
Initials:

Processed
Ship ID:
Initials:

Document and Forms Management
Form F3786
Aug 2004

Declaration

I, [redacted] *(Print name)*
of [redacted] *(Print company/business name)*
[redacted] *(Print address)*
being the
☐ Manufacturer ☐ Manufacturer's Agent
☒ Accreditation Holder (Accreditation No. [redacted])

Declare that in accordance with the requirements of the Transport Operations (Marine Safety) Act 1994, the ship as described above, because of the way it is built or the materials from which it is constructed or both, is able, when filled with water, to remain afloat in an upright position while carrying its normal operational equipment and the total number of persons recorded in this statement.

I make this declaration as a result of:-
☐ Swamp test conducted on / / (day / month / year)
or
☒ Calculations to a recognised standard on 16/05/05 (day / month / year)
or
☐ Compliance with Type Approval No ..... on / / (day / month / year)

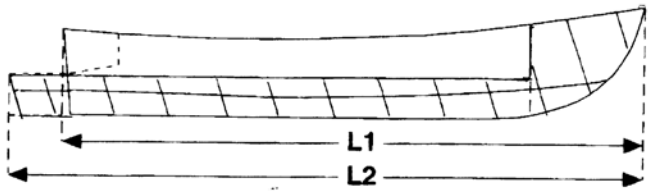
Signed by.. [redacted] *(Declarant)* on 16/05/05 (day / month / year)

Maritime Safety Queensland collects the name, address and signature of Manufacturers/Agents/Accreditation holders for the purpose of declaring that the ship, as described within this form, is built in accordance with the Transport Operations (Marine Safety) Act 1994. Some of the information on this form is used to form part of the Commercial Information and Registration Management System (CIRMS) in accordance with the Transport Operations (Marine Safety) Act 1994.

Please return completed statement to your local MSQ regional office as listed overleaf

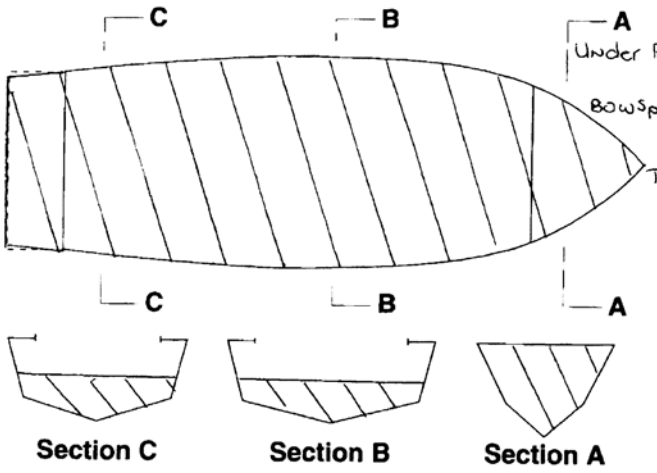
FOAM / BUOYANCY LOCATIONS

1. Complete the diagrams to show the locations and area of buoyant material thus ▨
2. If the ship has a pod, complete the dotted sections.
3. Complete *SECTIONS A to C* to represent the location of the buoyant material.
4. Show total cubic capacity of buoyant material and type.
5. In the case of catamarans or hybrid ships attach sketches.



L1 = 5.90m

L2 = 6.50m



Under Floor Space
= 1.58 m³
Bowspace
= 0.33 m³
Total = 1.91m³

Section C Section B Section A

List of MSQ Regional Offices

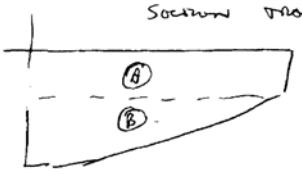
Centre	Office Address	Postal Address	Telephone (07)	Facsimile (07)
Pinkenba	Macarthur Avenue East, Pinkenba QLD 4008	Macarthur Avenue East, Pinkenba QLD 4008	3860 3561	3860 3540
Gold Coast	40-44 Seaworld Drive, Main Beach, QLD 4215	PO Box 107, Southport QLD 4215	5583 8300	5583 8288
Mooloolaba	Old Pilot Station, Parkyn Parade, Mooloolaba QLD 4557	PO Box 1094, Mooloolaba, QLD 4557	5477 8425	5444 6697
Bundaberg	Level 2, 46 Quay Street Bundaberg QLD 4670	PO Box 476, Bundaberg QLD 4670	4131 5608	4152 8528
Urangan	Buccaneer Avenue, Urangan QLD 4655	Buccaneer Avenue, Urangan QLD 4655	4128 9555	4128 9007
Gladstone	Level 2, 136 Goondoon Street, Gladstone QLD 4680	PO Box 123, Gladstone QLD 4680	4973 1200	4972 5520
Mackay	14 Discovery Lane, Mt Pleasant QLD 4740	PO Box 10085, Mt Pleasant QLD 4740	4944 3700	4944 3790
Airlie Beach	Level 1, 384 Shute Harbour Road, Airlie Beach QLD 4802	PO Box 717, Airlie Beach, QLD 4802	4946 2200	4946 2233
Townsville	60 Ross Street, South Townsville QLD 4810	PO Box 1921, Townsville QLD 4810	4771 5135	4721 2028
Cairns	64-66 Tingira Street, Portsmith QLD 4870	PO Box 1787, Cairns QLD 4870	4052 7400	4035 1127

(1) 23/02/05

59m Offshore

PRELIMINARY BUOYANCY CALCULATIONS

SECTIONS THROUGH TO CTR FRAME.



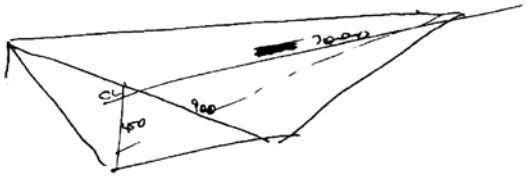
LENGTH = 2.40 MTRS
AV ½ WIDTH = 900
AV SIDE HT = 140
"V" CTR DEPTH = 300

(A) $V_A = 2.40 \times 1.80 \times .140$
$= .605 m^3$

(B) $V_B = 2.40 \times .80 \times .3$
$= .576 m^2$

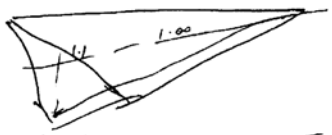
(2) CTR FRAME TO BOW. BELOW DECK (TRIANGULAR)

L =



LGTH = 3000
AV W = 900
AV DEPTH = 225
V_{OVR} = .607

(3) FWD COMPARTMENT ABOVE DECK LEVEL (TRIANGULAR)



W_{TOP} = 1100
L_{TOP} = 1000
H = 900

AV LGTH = 500mm
AV WIDTH = 550 mm
AV DEPTH = 450 mm
V_{AV} = .123 m^3

(2)

* Calculations of Hull and Motors are additional not taken into account i.e. extra!

Vol this boat = 1.91 m³
i.e. Buoyancy = 1.95 T.

Est Weight this boat

Previous 6m Boat Built 1999 - 620 kg.
including (½ size) Cursor & Chain.
This Boat = 620 + 50 (cursor) + 40 (chain)
= 710 kg
+ motors = 275 kg.
+ Batteries, Accessories = 100 kg
Sub total = 1085
+ 6 persons @ 75kg = 450 kg
Total = 1535 kg

Under 0.1K.

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8.4 Guidance for swamp and stability tests

PART H

SWAMP & STABILITY TESTS FOR SHIPS UNDER 6 METRES

Section 40 of the *transport Operations (Marine Safety) Act 1994* places an obligation on builders and accredited entities with respect to general safety obligations. Section 66 of the *Transport Operations (Marine Safety) Regulation 2004* states that where a ship is less than six (6) metres in length MSQ may accept either a Positive Flotation Statement or a Certificate of Compliance for the building or surveying of the whole ship.

SWAMP TEST:

Where a Positive Flotation Statement is submitted it is expected that sufficient accompanying documentation will be submitted to allow an audit by MSQ staff. For the purposes of this audit, documentary evidence should be raised and retained by the builder / manufacturer or accredited entity detailing both the swamp and stability tests. In conducting the tests the ship should be loaded with the proposed number of persons, or weight, in accordance with Australian standard AS1799, as follows:

- 75 Kg per person for fishing charter and general activities;
- 110 Kg for diving operations;
- 15Kg to simulate the motor and any other equipment likely to be carried.

If the ship is to be used for the carriage of 'unusual' weights such as air compressors, allowance should be made for those circumstances. The ship should then be filled with water until the water inside the ship is level with the surrounding area. All air or void spaces should be opened or other measures taken to ensure an accurate result. Hull drainage bungs should then be removed to equalise the water levels.

The ship should remain upright and stable in the swamped condition and allow free movement of embarked persons. The ship should float in a stable and even keel with normal movement of arms and upper body possible without undue concerns regarding capsize.

The ship should maintain a freeboard of approximately **50 mm** at the lowest point of the gunwale excluding the cut-out for the outboard motor if applicable. Any ship that capsizes or exhibits a tendency to capsize during this procedure **must be considered as having failed the swamp test procedure**. This generally occurs as a result of buoyancy placed low in the hull.

Documentary evidence should be retained on both the swamp and stability tests in sufficient detail to fully explain the procedure used. Copies of this documentation are to be submitted with the Positive Flotation Statement. **For ships operating outside of smooth water limits reference should be made to the "*Guide for conducting Stability Assessment of Commercial and Fishing Ships*".** (Attachment I)

INFLATABLE BOATS & RIGID INFLATABLE BOATS (RIB)

The ship should meet the performance and safety criteria of **ISO6185 "Small Craft – Inflatable Boats".** The boat should be loaded to its maximum capacity including weight to represent persons, machinery and/or equipment. The largest air chamber (or one if all of similar size) should be deflated to simulate the worst possible stability condition. The boat should retain sufficient buoyancy to ensure the safety of embarked persons and of being capable of being propelled by one of its intended means. In no case should the ship be approved for the carriage of persons, equipment, motor and fuel in excess of the manufacturer's specifications.

For **RIB's**, additional to the above, the two largest void spaces in the hull should be opened to allow flooding during the swamp test. Where access to the void space/s is not provided, weight representing the volume of water in the breached voids should be placed on board adjacent to the void spaces. Should the RIB meet or exceed the general requirements of ISO6185 this may not be necessary.

Where a ship meets or exceeds the performance and safety criteria of ISO6185, it may not be necessary to carry out a stability test. However, documentation must be kept and copies forwarded to confirm the opinion of the builder or accredited surveyor that stability is sufficient for the intended operations.

HYBRID BOATS

Ships of hybrid or unusual design (for example, constructed of tubular alloy, composite, and so on) which rely on multiple air chambers should have a minimum of two chambers opened up to swamp testing. The chambers chosen should be those that produce the worst possible conditions.

Where ships are fully welded with no access provisions, the addition of weight representing the total volume of the chambers may be substituted. ISO6185 may be used to show comparable safety performance but in any case the builder or accredited surveyor should be satisfied that the ship is suitable for its intended purpose. Stability may be assessed at the time of swamp testing by following the guide of smooth water operations mentioned below.

PREPARATION (prior to swamping)

These details relate to the procedure for conducting a stability test for conventional monohulls. The need for this test may not be required in relation to inflatable boats, RIB's or hybrid craft provided the builder or accredited entity is satisfied that stability is sufficient for the intended operations. Documentation should be retained confirming this sufficiency. Stability information should also be submitted with the application for registration and the Positive Flotation Statement.

The ship should be loaded with safety equipment, motor or weight to represent materials likely to be carried. Placement of persons (or weight) should be apportioned as follows:

Ship size	Person/s amidships	Person/s close to gunwale
2 person	1	1
3 person	1	2
4 person	2	2
5 person	2	3
6 person	2	4

In larger ships all persons should be seated on one side of the centreline.

A freeboard of at least **75 mm** should be maintained at the lowest point of the gunwale or motor cut out during the **stability** test.

During **swamping** tests the ship should float in a stable and even keel with normal movement of the arms and upper body without undue concerns regarding capsize. A freeboard of at least **50 mm** at the lowest point of the gunwale excluding the cut out for the outboard motor (if applicable) should be maintained.

A typical format for recording stability information for smooth water operations might be:

Freeboard	Light	Loaded	Inclined	Swamped
Forward				
Midship				
Aft				
*Aft				

(* In way of motor cut-out in the case of outboard motor powered boats)

The following Australian Standards are applicable to these issues –

AS4132 - Boat and Ship Design and Construction

AS4393 - Small Craft – Hull Identification and Coding System

ISO6185 - Small Craft – Inflatable Boats

AS1799 - Small Pleasure Boats Code

8.5 Guidance for measurement of commercial ships

ANNEXURE G

GUIDANCE NOTES FOR MEASUREMENT OF COMMERCIAL SHIPS

DEFINITIONS

Breadth The maximum breadth measured amidships

(i) in the case of a metal hull - to the moulded line of the frame; and
(ii) in the case of any other hull - to the outer surface of the hull.

Depth The moulded depth measured at the middle of the measured length from the base line to the top of the freeboard deck beams at the side of the vessel.

For the purposes of this definition, the base line is the line of the top of the keel where a plate keel is fitted.
In the case of a timber or composite vessel the top of the keel is taken as the lower edge of the keel rabbet.

In the case of a vessel which has a bar keel or in which the form at the lower part of the midship section is of a hollow character, or thick garboards are fitted, the top of the keel is taken as where the flat of bottom continued inwards cuts the side of the keel of the vessel.

In each case the base line shall be horizontal.

Freeboard Deck

The uppermost complete deck exposed to the weather and sea, which has permanent means of closing all openings in the part exposed to the weather and sea and below which all openings in the sides of the vessel are fitted with permanent means of watertight closing.

Measured Length

(a) The distance from the fore part of the hull to the after part of the hull, measured at the upper side of the uppermost weathertight deck or, in the case of an open vessel, at the height of the gunwale,

OR

(b) 96% of the distance between a vertical line passing through a point being the foremost part of the hull and a vertical line passing through a point being the aftermost part of the hull, excluding appendages;

whichever is the greater.

Note: Clarification of the terms used in the definition of measured length are given below.

Fore part of the hull

The leading edge of the shell plating, planking or other structural material, or in the case of bar stems or stem posts, the intersection of the outside of the shell plating or planking with the stem bar or post. In all cases members added to the exterior of the hull shall be excluded, eg. fender, sponson, rubbing strip etc.

Foremost part of the hull

The most forward point of the vessel.

In all cases members added to the vessel and not forming part of the structure of the vessel shall be excluded, eg. fenders, pulpit rails, access door or ramp,, sponson, rubbing strip, etc.

Bulwarks are to be taken as part of the vessel.

After part of the hull

The trailing edge of the shell plating, planking or other structural material, or in the case of stern bars or posts, the intersection of the outside of the shell plating or planking with the stern bar or post. In all cases members added to the exterior of the hull shall be excluded, eg. fender, sponson, rubbing strip etc.

Aftermost part of the hull

The most aft point of the vessel.

In all cases members added to the vessel and not forming part of the structure of the vessel shall be excluded, eg. fender, sponson, rails, rubbing strip, etc.

Bulwarks are to be taken as part of the vessel

Height of gunwale

The vertical distance from the weather deck to the top edge of the fore and aft member which is fitted round the inside of the vessel at the top of the side shell plating, planking or other structural material.

Inflatable boats

Measured length shall be determined by measuring from the bow to the aft edge of the transom.