Australian Government
Australian Maritime Safety Authority

Domestic Commercial Vessel
INSTRUCTIONS TO SURVEYORS

DCV-ITS-009 (05/2019)

Subject: This instruction provides guidance on the sea trials a vessel should undertake as a part of initial survey to ensure its ability to safely navigate.

General: Commissioning trials are required by the National Law - Marine Surveyors Accreditation Guidance Manual 2014 as amended in June 2018 (SAGM) Part 2 Chapter 3.8 (1) (c), prior to a vessel being allowed to operate. These trials verify the function of vessel's systems essential to safety, including the; navigation systems, steering system, alarm system, fire safety system, etc.

Whilst some of the vessels systems will be commissioned and certified by the installer and/or manufacturer, these systems may require a sea trial to verify their functionality and to ensure that they are still operating in a correct and safe manner.

During the sea trial, a record including; the date, person inspecting, observations and conclusions of inspections undertaken throughout the commissioning phase, are to be recorded and retained.

Pre-trial Checks: A vessel must be safe to take to sea before commencement of sea trials. This includes testing the functionality of systems essential to safety.

Alarms

Commissioning of the vessels alarm systems should be verified and where practical, witnessed. This will ensure the safety of the vessels running systems and the persons on board during sea trialing. This check should include (but not be limited to) the following systems:

- Engine alarms
- Blige alarms
- Muster and evacuation alarms

Fire and Safety Systems

During pre-trial checks, verify the working order of the fire safety system. In doing this, systems should be operated and observed to ensure they meet the specifications set by the NSCV Part C4. These checks may include (but are not limited to) the following systems:

- Fire Pumps and Hydrants
- Fire Hoses
- Fire Flaps
- Fan Stops
- Fuel shutoff systems
- Fire control system access alarms
- Pre-Discharge Alarms
- Smoke alarms
- Thermal detector alarms
- Emergency Fire Pump

Safety Equipment

The type, quality and availability of safety equipment should be verified prior to the commencement of sea trials. Whilst a vessel may not be complete at time of trials, adequate safety equipment must be provided for the trial complement and as required for the specified trial area.

Communications equipment

The vessels communication equipment should be verified and tested to ensure that it is operational and functional. It is recommended the following systems are tested (if applicable):

- Marine Radio Systems – Log a radio test call.
- Public Address System (P.A.) – Making a test announcement, ensuring it is able to be heard in the appropriate places.
- Internal communication Systems – Test they are working between essential stations.

Navigation Equipment

Navigation equipment should be verified as being operational. These checks may include (but are not limited to) the following systems:

- Navigation Lights
- Global Navigation Satellite system (GNSS)
- Electronic chart display information system (ECDIS)
- Automatic Identification System (AIS)
- Speed and distance indicators
- Radar
- Depth Sounder

Engineering systems

Bilge pumping and, any transfer systems should be tested. Not all combinations of pumps and lines need be tested; however adequate tests should be carried out to verify all system components.

Emergency electrical

The vessels electrical systems should be tested to ensure its operation; including verifying the functionality of the vessels emergency electrical supply and emergency switchboard. After the surveyor verifies that the vessel has been; isolated from any shore power connections, operational generators and the main switchboard is isolated to simulate a power failure. They should check to ensure that all essential systems and navigation equipment remain operational, along with any emergency lighting or other requirements specified by the standard.

Sea Trials

Emergency Steering

A vessels emergency steering system should be operated to ensure that it is able to be safely used if needed in an emergency situation. To do this, the system should be connected (where applicable) and operated at a vessel speed deemed effective for navigation by the master.

Anchoring

Functionality of a vessels anchoring system should be verified at trials by:

- Deploying the anchor
- Operate the brake and securing arrangements.
- Retrieve the cable and observe the following; the speed of retrieval (note intermittent changes), cable slipping, jumping or movement of the winch.
- Where a secondary anchor is fitted and not positioned for immediate deployment. Trial must be undertaken to demonstrate that it can be deployed within 15 min.

Speed Trials

Speed trials should be conducted at an RPM range from idle to max RPM in order to observe the vessels handling characteristics at all operating speeds. The range should be broken up into a reasonable and practical number of intervals such that useful data is obtained for a range of speeds.

Whilst undergoing speed trials the vessels propensity to exhibit any undesirable characteristics whilst transitioning from displacement mode to planning mode or at any other time, should be recorded. A list of undesirable characteristics is provided in Annex 1.

Stopping Trial

The vessels ability to stop should be trialled in a safe and practical manner to ensure safe functionality of the vessel during emergency conditions. A procedure for a stopping trial is provided in Annex 2.

Manoeuvrability Trials

A range of manoeuvrability tests can be used to verify the vessels handling characteristics in various situations and confirm a vessels ability to safely navigate under a range of conditions. The recommended tests are as follows:

- Collision Avoidance Test (Small, Non-displacement vessels)
- Turning Circle Manoeuvre (Medium-Large vessels)
- Zig-Zag Manoeuvre (Medium-Large vessels)
- Pull out test (Vessels with a rudder)

Refer to Annex 3 for details on these manoeuvres.

Vessel handling characteristics in a seaway

If the vessel is sea going, its handling characteristics when encountering swell should be observed. The vessel should be trialled in the following conditions to observe its behaviour:

- Vessel heading in a straight line into swell
- Vessel running with the swell, close to wave speed.
- Vessel running perpendicular to swell, in a straight line.

Annex 4 provides a list of undesirable characteristics that may be observed during testing.

Record of trials The administration of marine safety requires a record of commissioning trials be recorded and retained, the following information should be recorded in addition to the record or trial:

- Vessel Draft
- Trim of Vessel
- Weather conditions

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Annex 1

The following is a list of undesirable characteristic that should be watched for during speed trials for different vessel types.

All Craft:

- Directional instability or yawing (often coupled to roll and pitch instabilities).
- Excessive heel during turning, either outward or inward during one or more of displacement, transition or non-displacement modes.
- Excessive trim during one or more of displacement, transition or non-displacement modes.
- Slamming giving rise to excessive accelerations and potential structural damage.
- Flipping of the craft that might arise from aerodynamic lift at non-displacement.
- Horizontal accelerations.

Planing Monohulls:

- Bow diving owing to dynamic loss of longitudinal stability when planing which can occur in relatively calm seas.
- Reduction in transverse stability with increasing speed.
- Porpoising, coupled with pitch and heave oscillations that can become violent.
- Chine tripping, occurring when the immersion of a chine generates a strong capsizing moment.
- Flipping of the craft that might arise from aerodynamic lift at non-displacement.

Catamarans

- Bow diving in relatively calm seas due to dynamic loss of longitudinal stability.

Annex 2

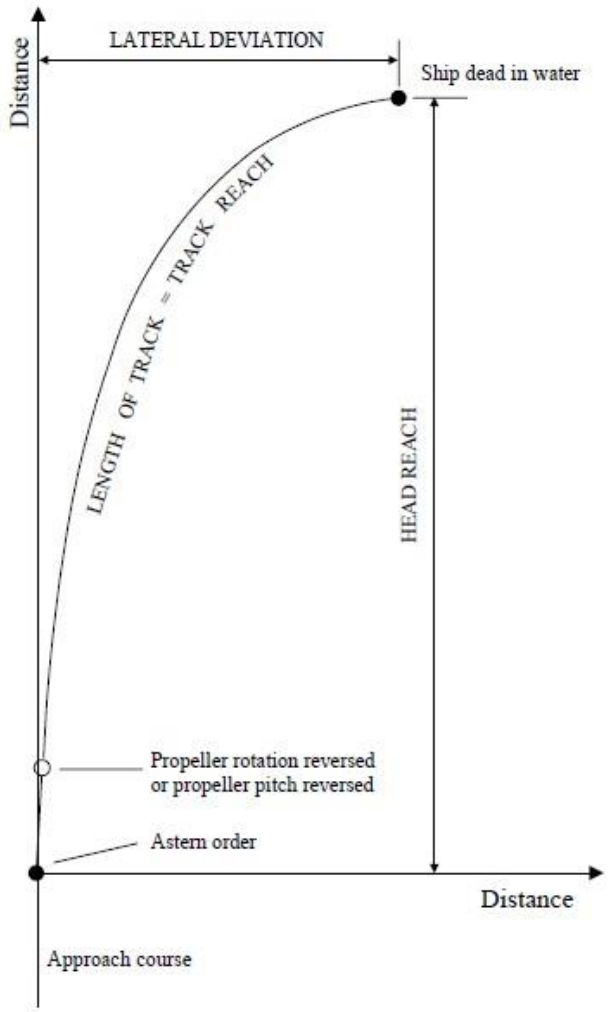
Stopping Test

The recommended procedure is as follows:

- The vessel is brought up to its maximum speed.
- The vessel must then demonstrate the ability to stop within 15 boat lengths.

If possible, the entire trajectory is to be recorded. The following information should be recorded:

- Head reach. The distance travelled in the direction of initial heading
- Track reach. The total distance travelled along the vessel's path
- Lateral deviation. The distance travelled in the direction, perpendicular to the direction of initial heading.

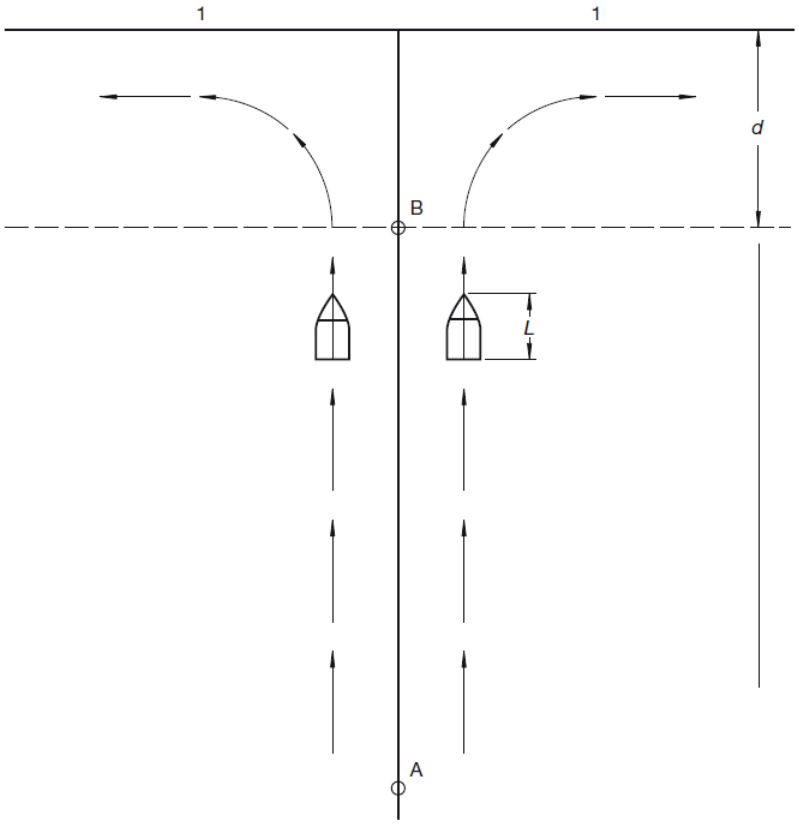


Annex 3

Collision Avoidance

The recommended procedure is as follows:

- Check the table of test requirements below for guidance on the distance of the avoidance course, then layout a course as seen in the diagram below.
- Operate the craft at full throttle straight ahead on a course parallel with marker line A–B (see diagram below).
- A turn shall be initiated when the bow of the boat reaches a point opposite marker B (refer to diagram).
- Execute turn without reducing the throttle setting, without crossing the avoidance line, established by the speed of the vessel at a distance of 'd'. Once the turn has been completed, assume a course parallel with the avoidance line.
- To pass the test, the craft shall undertake the test as many times as deemed necessary, in such a way that the operator experiences no loss of directional control or stability and no difficulties maintaining position at the helm.

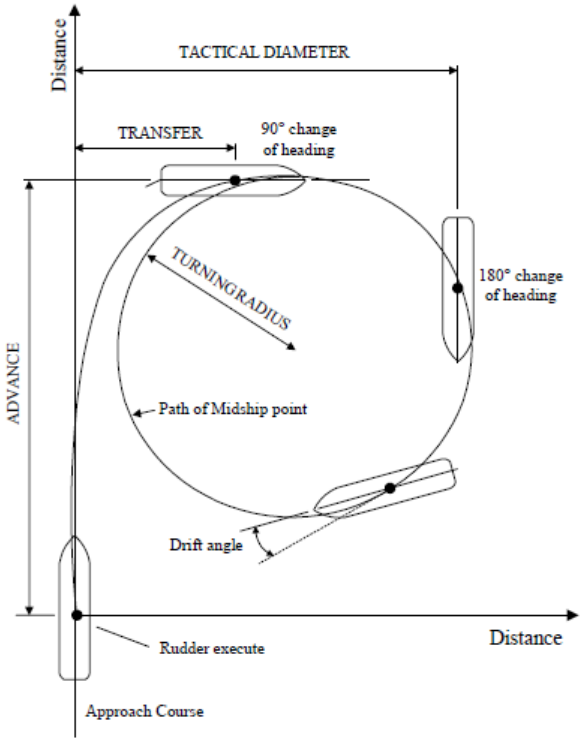


SUMMARY OF TEST REQUIREMENTS

Max. speed (v_{max}), knots	Test	Distance from avoidance line, *d*, m	If test failed
$v_{max} \leq 7\sqrt{L}$	no	–	–
$7\sqrt{L} < v_{max} \leq 30$	yes	$6L$	Reduce power rating, retest at v_{max}, or retest at >85% of v_{max} to pass, and install speedometer.
$v_{max} > 30$	yes	$6L + 2(v_{max} - 30)$	Reduce power rating, retest at v_{max}, or retest at >85% of v_{max} to pass, and install speedometer.

Turning Circle Manoeuvre

It is recommended that the turning circle manoeuvre is to be performed to both starboard and port. The rudder angle is to be the maximum design rudder angle permissible at the test speed, but it is not required to be more than 35 degrees. The rudder angle is executed following a steady approach with zero yaw rate. During trials, it is necessary to complete a turning circle of at least 720 degrees for both starboard and port turns.



The following information should be obtained and recorded to verify the safety of the vessel:

- Tactical diameter
- Advance
- Transfer
- Loss of speed in steady turn
- Time taken to change heading by 90 degrees
- Time taken to change heading by 180 degrees
- Final yaw rate

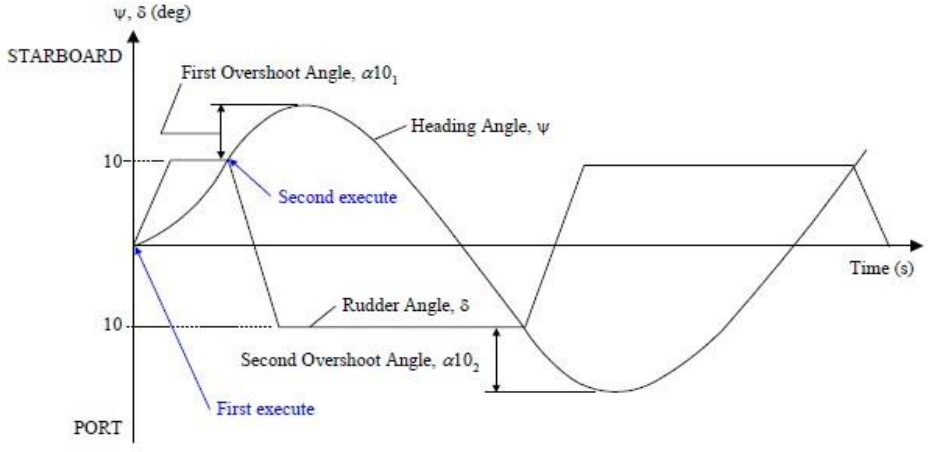
If possible, the entire trajectory is to be plotted.

Zig-zag Manoeuvre

A zig-zag test is recommended to be performed by applying a specified rudder angle (10 degrees for 10/10 zig-zag test, and 20 degrees for 20/20 zig-zag test) to an initially straight approach ("first execute"). Once the change of heading has reached its specified value (10 or 20 degrees, respectively), the rudder is then immediately deflected to the opposite side with the same angle.

If possible, the entire trajectory should be plotted. The following information is to be recorded from the zig-zag test:

- Initial turning time. The time from the first execute until the vessel reaches the specified heading (10 or 20 degrees).
- Reverse rudder heading angle. Actual heading angle at which the rudder has been reversed.
- Overshoot angle. The difference between the specified angle value and maximal heading angle reached before the course is reversed. Both first and second overshoot angles are to be recorded.
- Time to check yaw. Time elapsed from the moment of the first or second execute to when maximum change of heading is reached.
- Reach. The time between the first execute and the instant when vessel heading is zero.
- Time for complete cycle. The time between the first execute and the instant when the time is zero after the third execute.

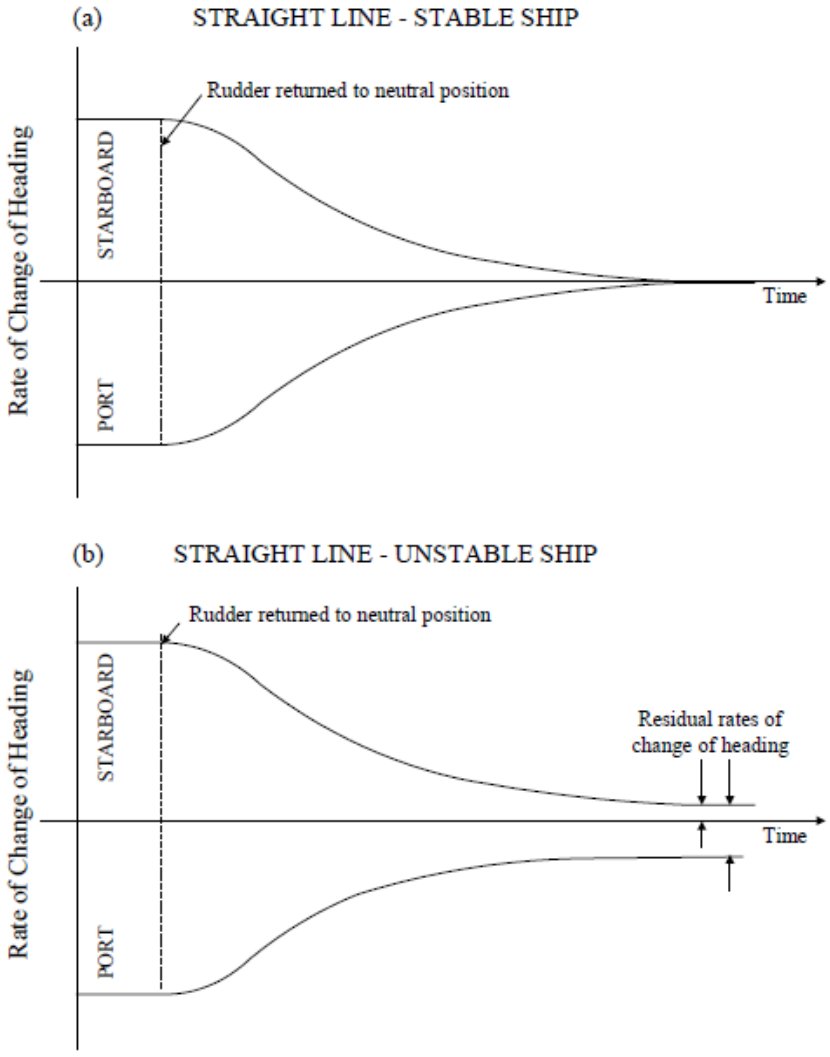


"Second execute" is to be made when the vessel reaches the specified heading change. However, as reversing of the rudder also takes finite time, the actual change in heading may be different from the specified value.

The Pull-out Test

The pull-out test allows for the determination of whether a vessel is dynamically stable and able to keep the course. After the completion of the turning circle test, the rudder is returned to neutral position, (zero for twin screw vessels, may not equal to zero for single screw vessels) and kept there until a steady turning rate is obtained. This test gives a simple indication of a vessel's dynamic stability on a straight course. If the vessel is stable, the rate of turn will decay to zero (within accuracy of vessel equipment) for turns to both port and starboard. If the vessel is unstable, then the rate of turn will reduce to some residual rate of turn. The residual rates of turn to port and starboard indicate the magnitude of instability at the neutral rudder angle.

Note: This test should only be used to identify course instability.



Annex 4

The following trials should be undertaken to identify any un-desirable characteristics of the vessel:

Run the vessel in a straight line into the swell

A list of un-desirable characteristics is as follows:

- Vessel slamming giving rise to excessive accelerations and potential structure damage.
- Bow diving due to insufficient reserve buoyancy at the bow
- Water on deck
- Vessel pitching

Operate the vessel with the swell (close to wave speed)

A list of un-desirable characteristics is as follows:

- Any difficulty that the master may experience in maintaining heading and course as the swell overtakes the vessel.
- Any difficulty that the master may experience in being unable to overtake the swell or slow the vessel (i.e. avoiding becoming trapped).
- Loss of longitudinal stability.
- Plough-in due to insufficient reserve buoyancy forward.

Operation of the vessel in a straight line, running across the swell (perpendicular to swell direction)

A list of un-desirable characteristics is as follows:

- Any difficulty that the master may experience in maintaining heading and course, and any hazardous heel of the vessel, as the swell crosses the vessel.
- Any difficulty that the master may experience in being unable to turn into or away from the swell.