Kellian Line Setter Sea Trials

Initial Performance Testing:

Project 4529

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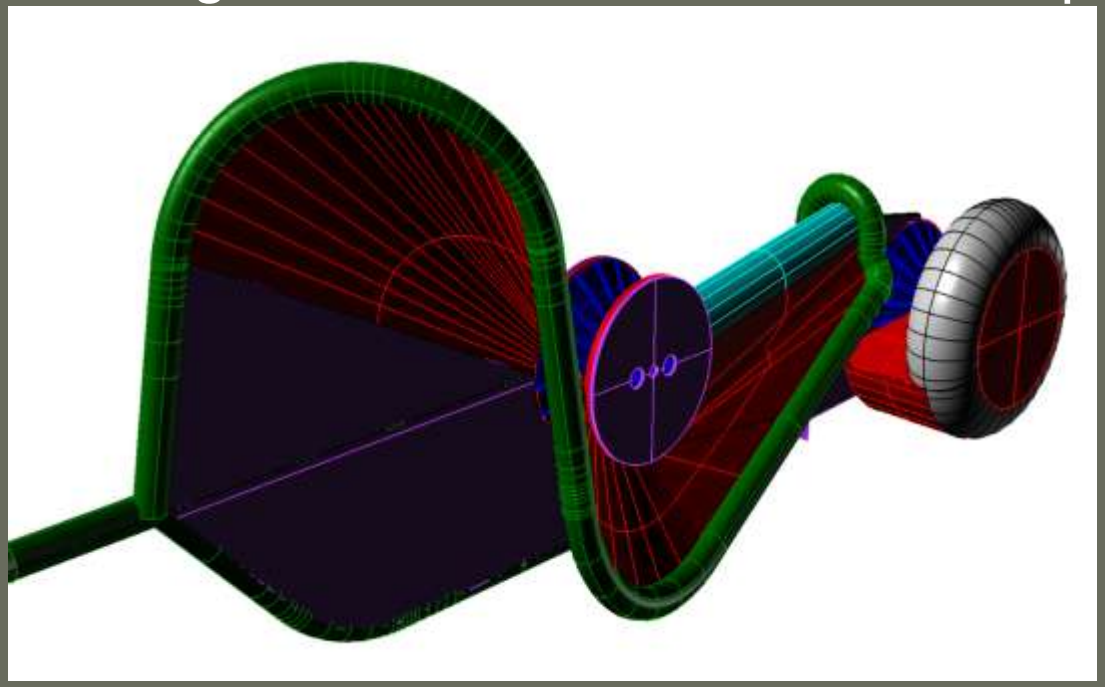
background:

- developed by fisherman Dave Kellian to mitigate catch of black petrels & FFS in NZ's inshore snapper fishery

- towed device designed to set demersal LL underwater
- could be easily applied to any demersal LL operation, incl. autolining
- KLS-1 needed refining to resolve technical issues - gear fouling on rollers

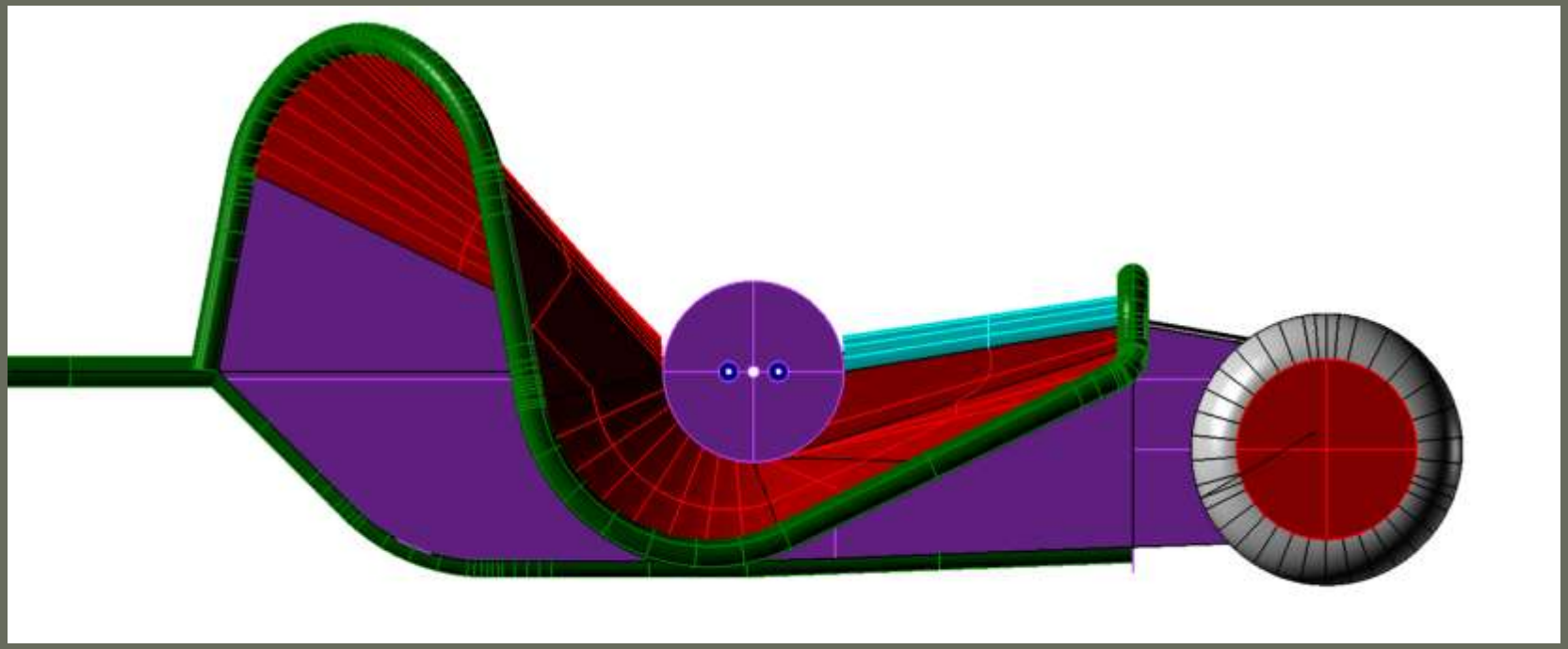
background

- 2011 new prototype developed, refined in AMC flume tank to achieve a performance standard of setting hooks through the line setter without foul ups.



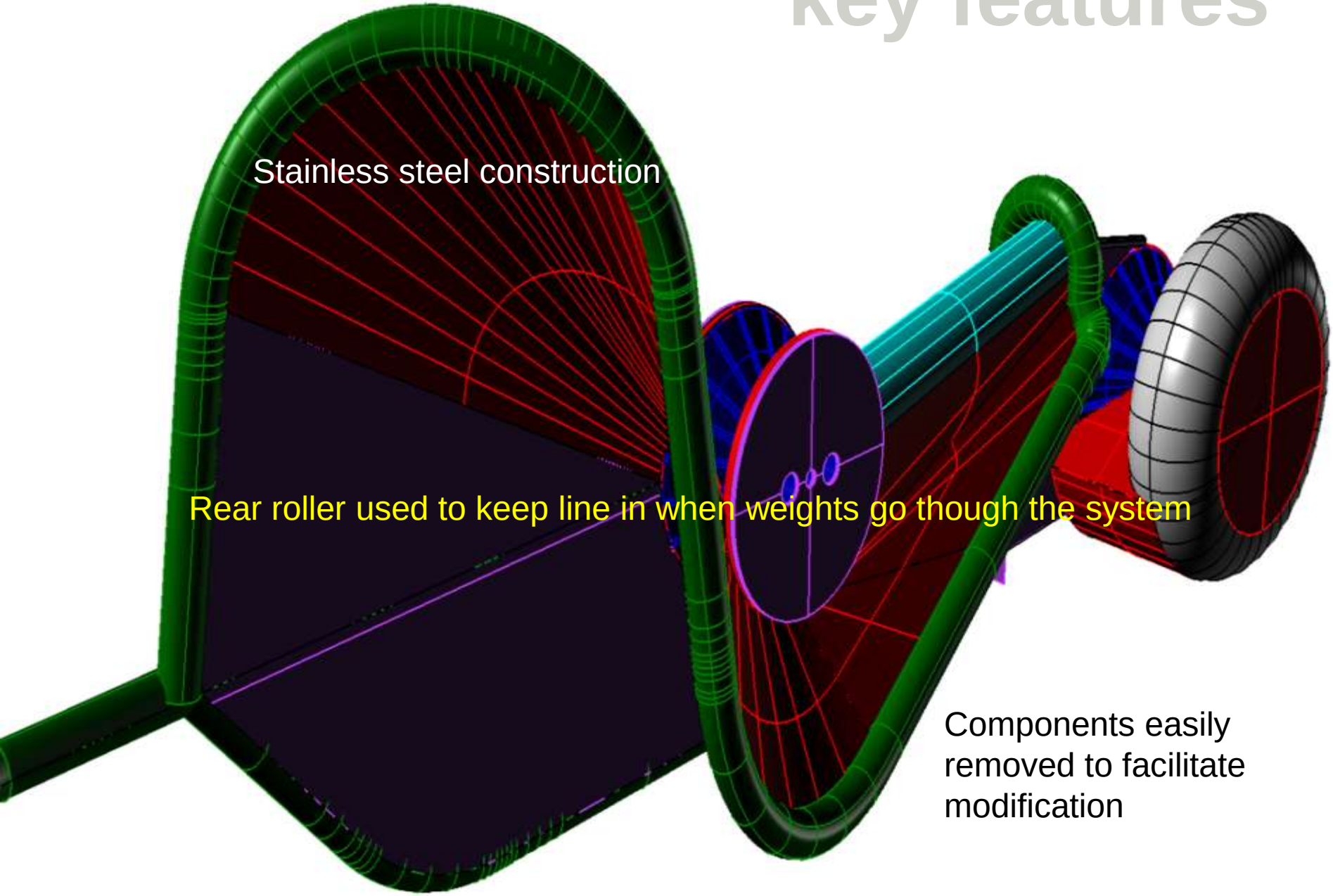
- stainless steel cowling & funnel arrangement that incorporates two rollers, and which is towed behind a vessel at depth

side view



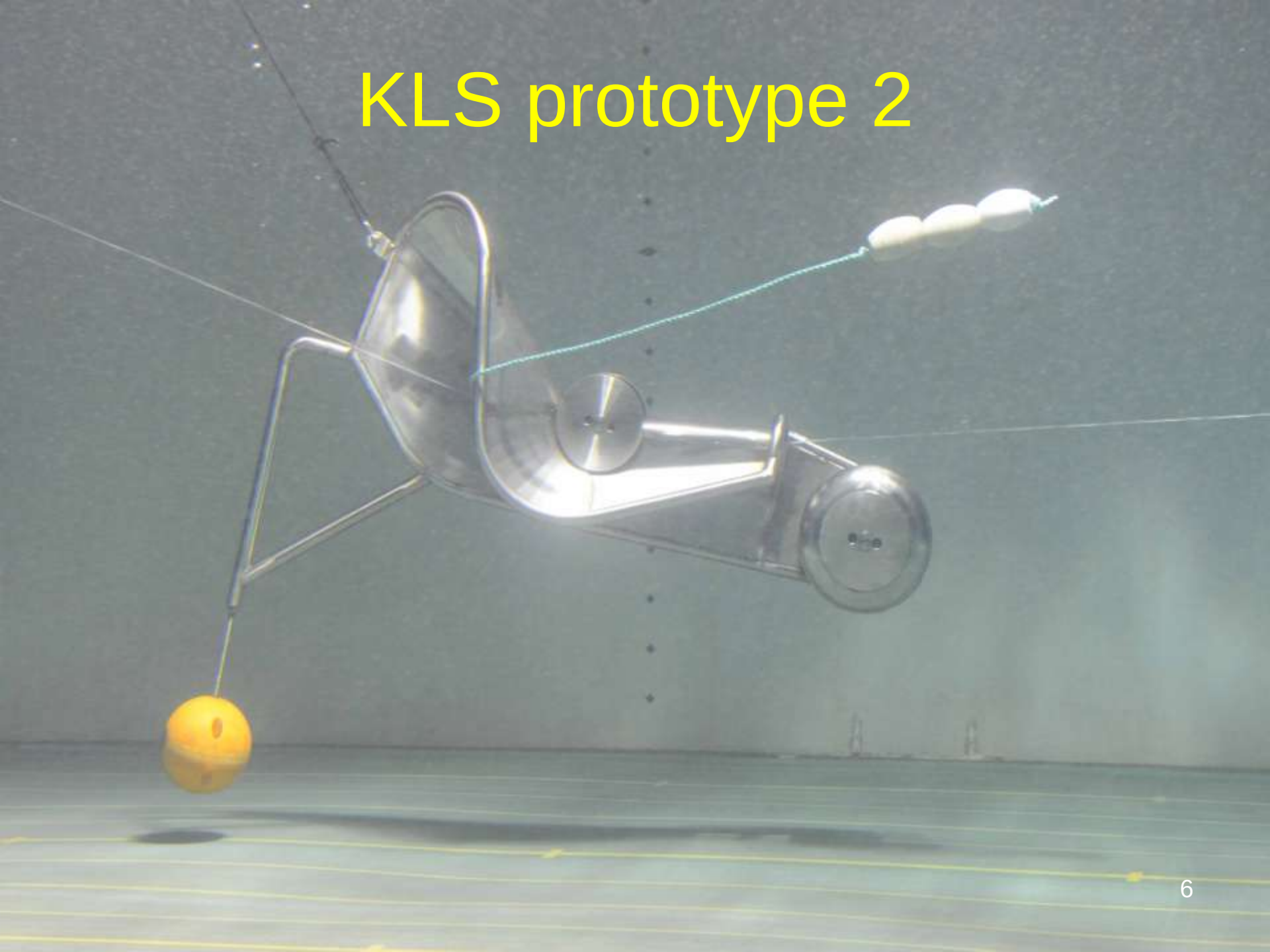
Front roller & rear roller

key features



Components easily removed to facilitate modification

KLS prototype 2



lessons from the flume tank

- preliminary trials at-sea (set 10,000 hooks), to assess if further development required:
  - dropping of mainline
  - effect of different floats and weights on performance at sea
  - retention of bait
  - ease of operation re manual handling (wgt 32 kg)
- more extensive trialling under fishing operations

Objectives of sea trials

1. identify the range of bottom longline gear & conditions that allow effective & safe use of the KLS 2

2. describe line sink profiles of bottom longlines set through the device, as a proxy for mitigation effectiveness

3. provide recommendations on any further development and refinement of the device that may be required to enable reliable, effective and safe use in commercial bottom longline fishing operations

research plan

Three phases

1. Setup equipment on board FV Kotuku to facilitate easy deployment and retrieval of KLS-2, and resolve any issues on tracking and surfacing

2. Initial performance testing using a limited range of gear configurations.

3. Further performance testing with more extensive range of snapper and bluenose gear configurations, including line sink tests using TDRs to develop line sink profiles as a proxy for seabird capture risk.

   At all stages undertake ongoing minor modifications as necessary to continually improve performance.

initial performance testing

- setup equipment on board FV Kotuku
- small crane installed to facilitate deployment & retrieval
- video cameras for critical performance review
- Initial trip:
  - linesetter sat reasonably straight at low speeds (< 2 knots), pulling slightly to starboard.
  - With a longer tow rope and higher speeds setter ran progressively further to starboard and at a shallower angle, before breaking the surface at about 4 knots.
  - KLS 2 appeared to roll over at speed, such that the ball was further out to starboard than the top.

initial performance testing

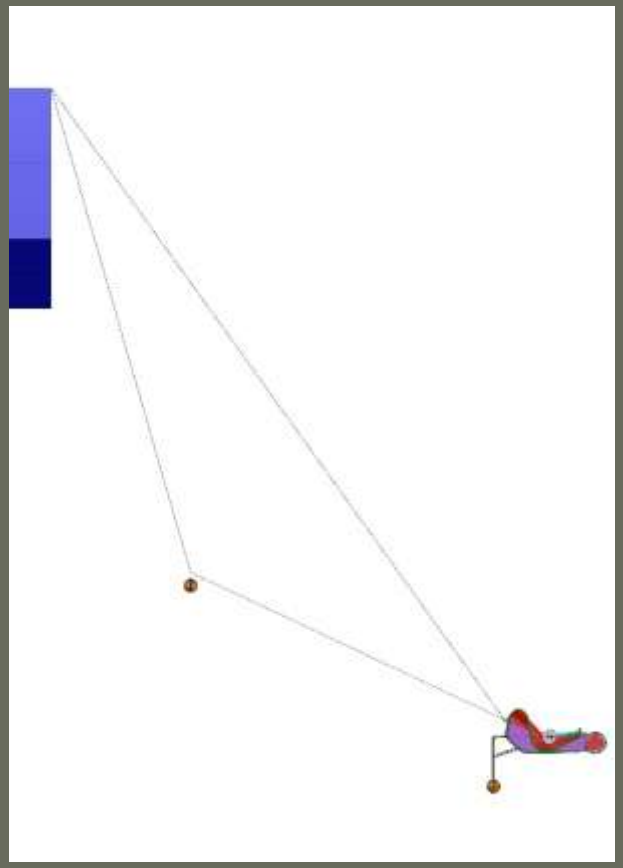
Trips 2 to 5 undertook a series of systematic changes to address 2 key issues

— tracking to starboard under tow, &

— surfacing when towed at speed due to increased drag under various sea conditions

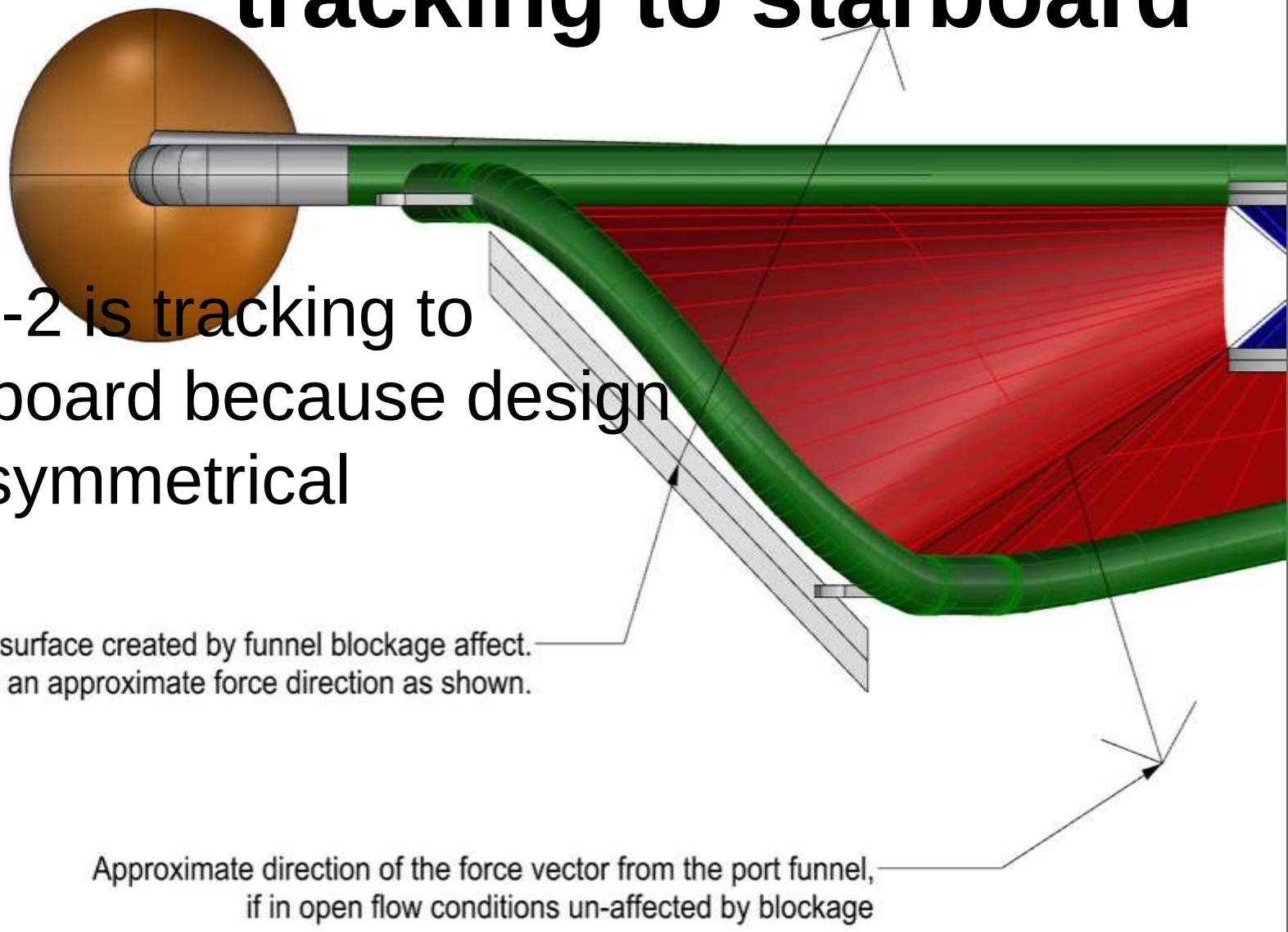
Surfacing

- tension in the line generates an upward force component directly affected by the towing angle and total drag of the unit
- reducing the towing line angle (and hence upward force) by adding a dropper weight into the tow line
- alternatively, install a small paravane to direct force downward

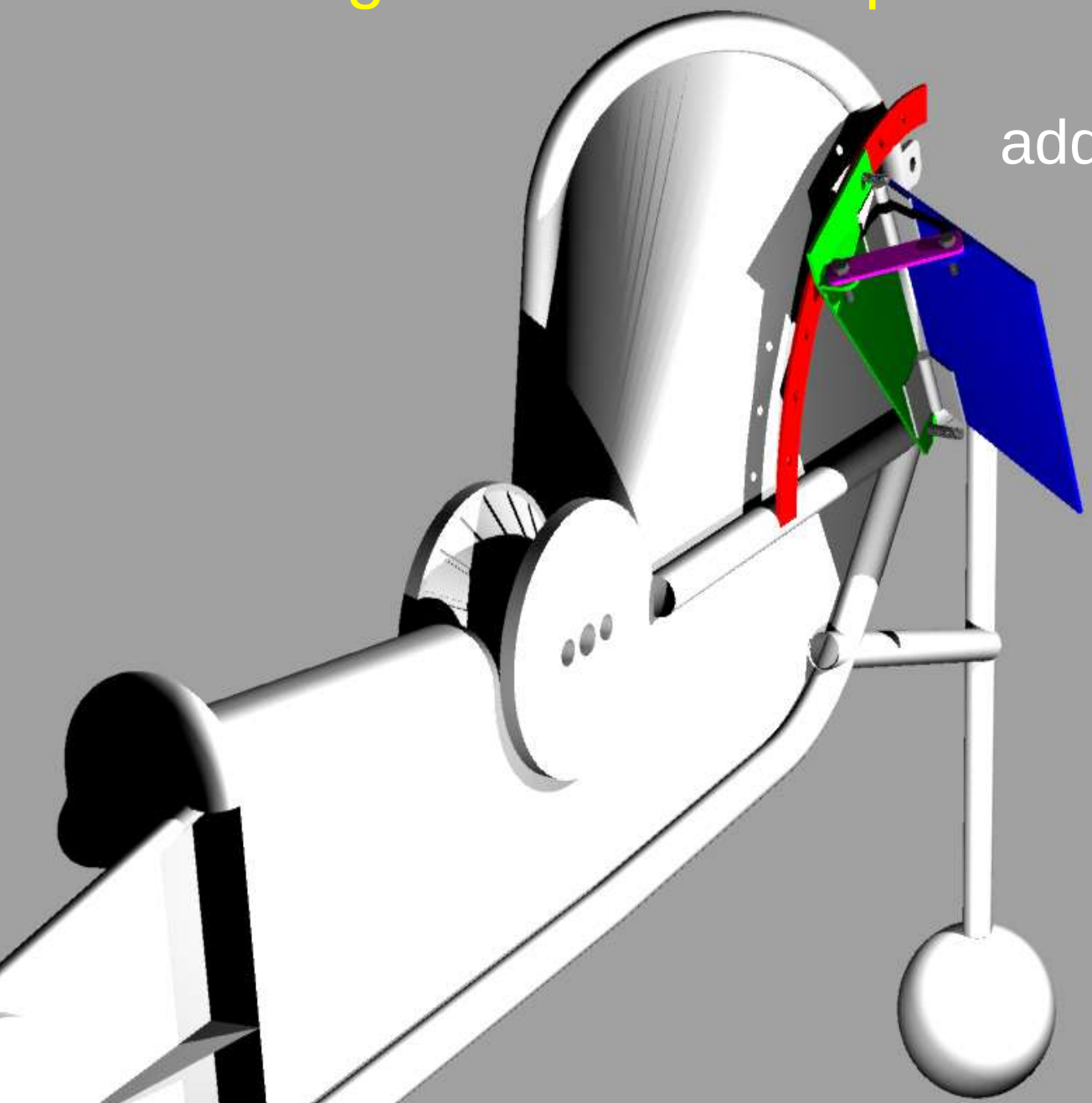


tracking to starboard

- KLS-2 is tracking to starboard because design is asymmetrical



tracking to starboard – potential solutions:



addition of a paravane
port side of

- a series of test runs performed with different settings
- speed through water (4.5 knots) & tow rope length (10 m) kept constant for all runs.
- changes included:

— adding an adjustable paravane beside the funnel
— increasing the weight of the ball
— increasing the length of the stud above the ball,
— moving the towing point, and
— adding a second paravane above the ball

- Following each trip data was analysed, modifications made to setter, and a test plan formulated to trial different settings for the subsequent trip

- Iterative approach involved balancing various forces acting on the line setter so that it ran at depth & straight behind the boat.
- Extra weight below the setter also provided more stability, making it less sensitive to small adjustments and less susceptible to towing at large angles of roll.
- Trip 5 - small amount of gear deployed
  - a couple of momentary hook catch ups
  - video footage indicated a more normal set with a longer longline, and more tension in the backbone, would produce a more consistent indication of performance

- Trip 6 – setting a longline
- 300 baited hooks set
  - 15 m tow rope used, such that setter ran at depth of 4 - 4.5 m
  - setting speed 4 knots, increased to 5 knots
  - hooks clipped on at normal 4m spacing for most of set
  - 3 weights & 2 floats added to line
- video showed line came out of back roller as setter was lowered into water
- setter tracked straight behind boat with minimal (< 5 degrees) clockwise roll and a pitch angle of approximately 15 degrees nose down
- some fish caught

recommendations for future work

- return to AMC flume tank to refine
- combine two paravanes or simplify while retaining desired force to maintain depth and angle of pitch
- retain paravane adjustment for future sea trials
- funnel shape could be refined slightly to stop the line rubbing on its leading edge and to guide the traces around the outside of the funnel
  (to assist deployment of floats)
- guide needed to send weights around the side of the rear roller so weights on ‘dropper’ ropes can be deployed.
- modifying rear roller cheek could also help passage of weights through the setter.

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