

Final design package including drawings and specifications
Integrated Measurement of Naval Sonar Operations and Precise Cetacean
Locations: Integration of Fastloc GPS into a LIMPET tag.

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Seward Association for the Advancement of Marine Science dba Alaska SeaLife Center

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Project Summary

The objective of this project was to integrate a Fastloc® GPS into a remotely deployed medium-duration satellite dart tag suitable for attachment to a beaked whale. This modification will allow the opportunistic medium-term (weeks to months) monitoring of the reaction of cetaceans, including sonar-sensitive Blainville's (*Mesoplodon densirostris*) and Cuvier's (*Ziphius cavirostris*) beaked whales, to Mid-Frequency Active (MFA) sonar operations with a high degree of spatial precision not currently available with medium-term satellite tags. These data, which will include precise localizations, and the presence or absence of deep foraging dives before, during, and after sonar exposure, are critically needed inputs for the Population Consequences of Disturbance (PCoD) model that is being developed to measure the health of animal populations. The project consisted of three phases.

Task A Objective: The objective of Task A was to integrate the Fastloc® GPS receiver into the Low Impact Minimally Percutaneous External-electronics Transmitter (LIMPET) style package and conduct land-based testing. Satisfactory completion of the testing will be the go / no go criterion to exercise the Phase 2 option.

Task B Objective: The objective of Task B was to conduct field tests of the GPS LIMPET tags on several species of cetaceans to assess tag performance. Successful completion of field testing will be the go / no go criterion for exercising the Phase 3 option.

Task C Objective: The objective of Task C was to provide ten of the final variant of the Fastloc-GPS LIMPET tags so our collaborating NUWC contractor Cascadia Research Collective could deploy them at SCORE prior to a Naval MFA sonar exercise.

REPORT DOCUMENTATION PAGE

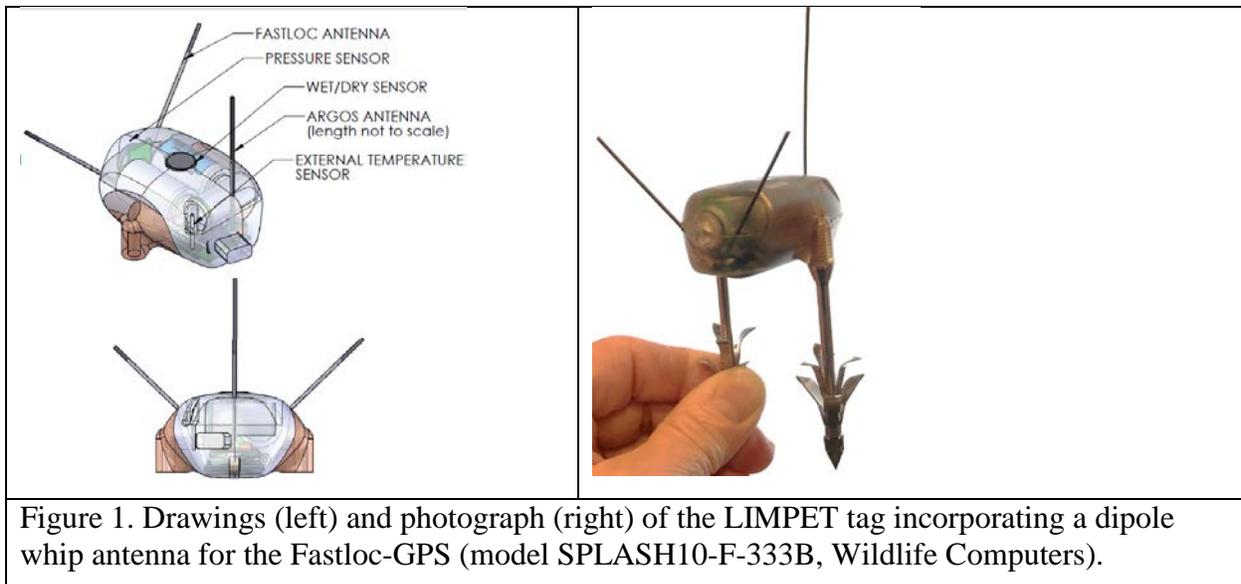
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14. ABSTRACT The objective of this project was to integrate a Fastloc® GPS into a remotely deployed medium-duration satellite dart tag suitable for attachment to a beaked whale. This modification will allow the opportunistic medium-term (weeks to months) monitoring of the reaction of cetaceans, including sonar-sensitive Blainville's (Mesoplodon densirostris) and Cuvier's (Ziphius cavirostris) beaked whales, to Mid-Frequency Active (MFA) sonar operations with a high degree of spatial precision not currently available with medium-term satellite tags.					
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Final Design Package

The final objective of the Fastloc-GPS portion of our project, “Integration of Fastloc GPS into a LIMPET tag”, was to continue to work with the commercial satellite tag manufacturer, Wildlife Computers (Redmond, WA), to produce a final design of the GPS LIMPET tag and to procure a final lot of 10 tags for testing at sea by Cascadia Research Collective collaborators working under their own NUWC contract in the overall ESTCP project’s third year. The final design is the model 333B (officially the SPLASH10-F-333B), and is illustrated in the following figures, and the attached specifications sheet from Wildlife Computers: “SPLASH10-F-333B, Stacked Dart Finmount, 2-Lay, Extended depth range”. Additionally, the Fastloc-GPS LIMPET tag is now offered as a standard, commercial product, by Wildlife Computers, along with the other variants of the LIMPET tag, as highlighted in the attached Wildlife Computers LIMPET product sheet, v.17-06. Fig. 1 shows a labeled sketch accompanied by a photograph of the SPLASH10-F-333B.

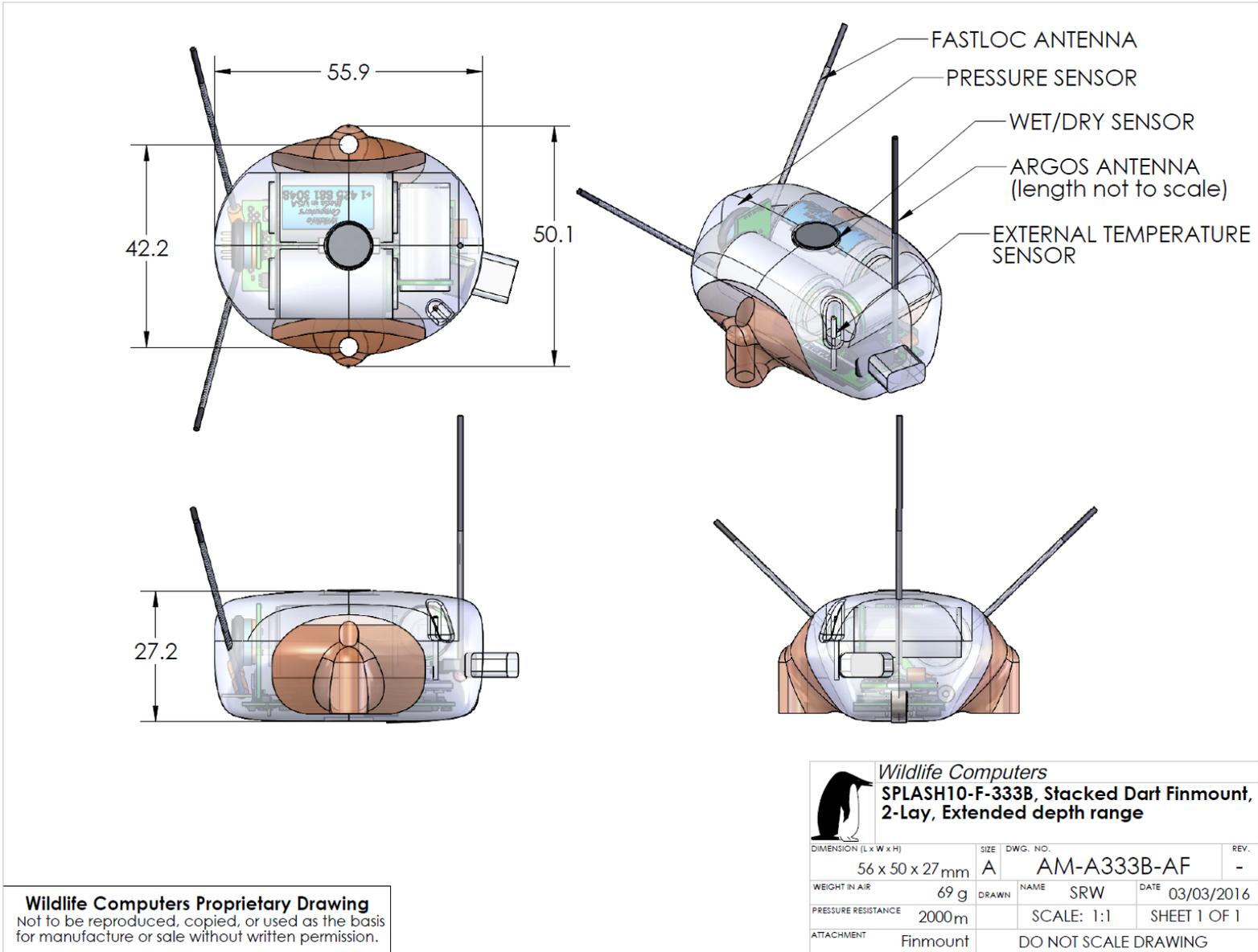


The final design of the Fastloc-GPS LIMPET model SPLASH10-F-333B, is characterized by the following physical specifications: maximum length (not including antennas): 55.9 mm; maximum width (not including antennas): 50.1 mm; maximum height (not including antennas): 27.2 mm; mass: 70.1 grams

The Alaska SeaLife Center final report will summarize the Fastloc-GPS LIMPET tag development process, test results and lessons learned, to be submitted separately, IAW CDRL A002.

Acknowledgements

This project would not be possible without the excellent work of the staff at Wildlife Computers and Kylie Owen and our collaborators at Cascadia Research Collective, primarily Greg Schorr, Daniel Webster and Robin Baird.





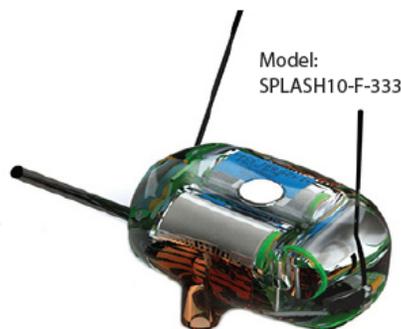
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LIMPET SUITE PRODUCT SHEET

Low Impact Minimally Percutaneous Electronic Transmitter (LIMPET) tags are widely used for cetacean tracking. LIMPETS were originally designed in 2006 for tracking killer whales. Since then, LIMPETS have tracked more than 20 species of whales and dolphins.

Users deploy LIMPETS remotely with a pneumatic rifle or crossbow anchoring two small titanium darts into the thin outer layer of blubber. The electronics remain external and, when the animal surfaces to breathe, the tag transmits data to the satellites. Typical deployment durations range from weeks to several months.



Wildlife Computers offers three separate LIMPET feature options: SPOT, SPLASH10, and SPLASH10-F.

Tag Type	SPOT-240	SPLASH10-292	SPLASH10-F-333
Package Details	Horizontal Movement Location only satellite tag	Behavior and Horizontal Movement Data archiving satellite transmitting tag	Behavior and Highly Accurate Horizontal Movement All the features of the SPLASH10 plus Fastloc® GPS locations
Key Features and Data Options	<ul style="list-style-type: none"> Argos Doppler Locations (accurate to 250 m) Percent-Dry Timelines Time-at-Temperature Histograms 	<ul style="list-style-type: none"> Argos Doppler Locations (accurate to 250 m) Depth & Temperature Time-Series Histogram and Dive Behavior Summary Messages Temperature Profiles Available with a standard or extended range depth sensor 	<ul style="list-style-type: none"> Fastloc GPS Locations (accurate to 20 m) Argos Doppler Locations (accurate to 250 m) Depth & Temperature Time-Series Histogram and Dive Behavior Summary Messages Temperature Profiles Available with a standard or extended range depth sensor
Life	160 days	80 days	90 days
Dimensions	54 x 54 x 20 mm	58 x 47 x 25 mm	56 x 50 x 27 mm
Weight	49 g	63 g	69 g