

Advanced Leak Detection Lidar (ALDL), 6th Quarterly Report

Date of Report: *February 23, 2015*

Contract Number: *DTPH56-13-T-000004*

Prepared for: *DOT, PHMSA*

Project Title: *Advanced Leak Detection Lidar*

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For quarterly period ending: *February 28, 2015*

1.0 Funds and Work Completed During this Quarterly Period

This report covers the sixth 3 month period of the research effort. A summary of the project-to-date cost history, which ties to the Delivery Milestones, is provided in **Figure 1**, below. The variance in Q6 remains dominated by late delivery of the laser assembly, Milestone D18, Task T4, which has slipped again and is projected to be completed in April (next quarter).

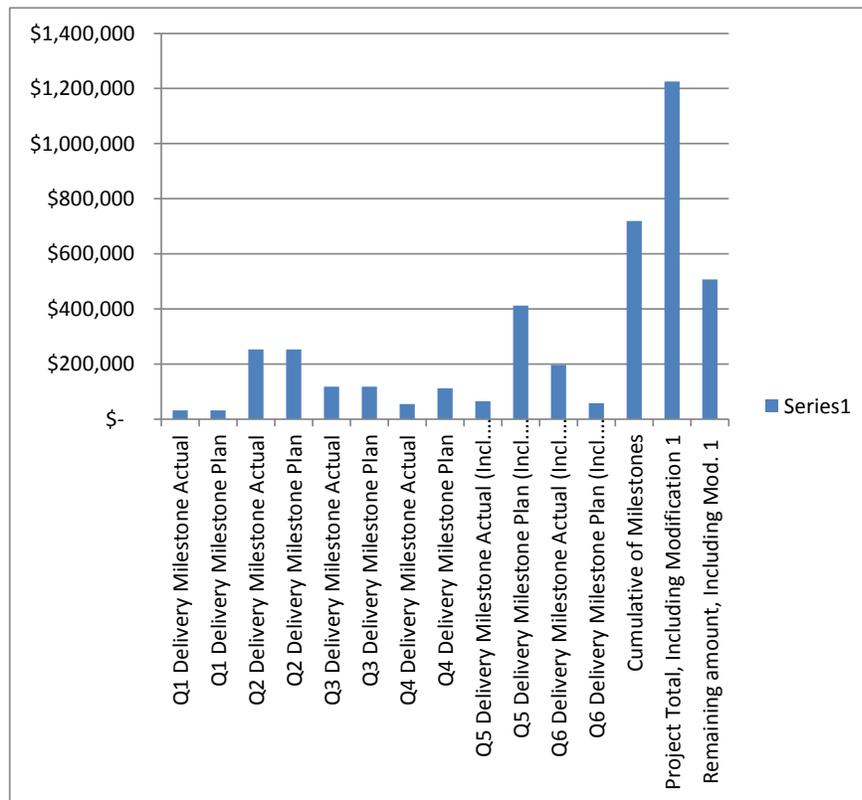


Figure 1, Achievement of payment milestones through the 6th quarter.

2.0 Progress Against 6th Quarter Delivery Milestones

Summary of Progress: There is one main issue affecting progress on the project: This is late completion of the laser assembly. Details of the issue and related corrective actions are provided in the discussion of Delivery Milestone 18, below. Given these delays, some re-planning is in-work to ensure the remaining project funding carries through completion of the flight demonstration testing of the ALDL instrument later in CY2015.

The table at the top of the next page summarizes progress against key milestones on ALDL development that are due for completion in Quarters 4 -6. Some milestones were accelerated, including: signal processing with software in the loop, fabrication of the optical bench. Other milestones were delayed, including receipt of all procured items for receive and transmit paths and the industry conference presentation and technical paper. The black Xs below indicate the planned completions. Green Xs indicate completions on-time or early and the red Xs indicate re-planned completions. Note that the Modification Request including Delivery Milestones D32 and D33 was not incorporated into the project until after Q6 had been started. So, while they had been originally planned for Q5, the earliest they could be completed was in Q6.

Key Milestone Delivery Number & Name	Q4	Q5	Q6	Q7	Notes
D14, Validate electrical interfaces	X,X				
D15, Procure receiver and detector components	X		X		Off-axis parabola received in January, 2015
D16, Industry conference & paper	X				Not yet re-planned
D18, Procure laser transmitter components		X		X	Laser assembly has slipped into Q7
D19, Update performance model with as-built characteristics		X,X			
D20, Validate signal processing with software in loop	X	X,			
D22, Fabricate optical bench & structure		X		X,	
D23, Annual peer review			X		This milestone had been planned in Q6, but is subject to scheduling by PHMSA
D32, Initiating pointing control and geo-location software development		X		X	Project software engineers suggest delaying this task until the WASM hardware is completed to improve the efficiency of software development.
D33, Start Wide Angle Steering Mirror (WASM) fabrication.		X	X		The delay of this milestone is primarily due to delays in finalizing the Modification Request.

The following paragraphs provide specific information for all milestones completed or missed this quarter.

Delivery Milestone D21. Task T1 Technical Management (Accomplished): Task T1 is the ongoing, level-of effort to organize and manage the project with associated contractual delivery milestones each quarter. Key items for the 6th quarter are:

- Monthly and Quarterly Reports prepared and submitted.
- Schedule/technical issues with the laser assembly are being aggressively managed. The discussion under Delivery Milestone 18, below provides details and corrective actions.
- Work per the Modification Request to add Pointing Controls to the ALDL instrument has begun and the components for the Wide Angle Steering Mirror pointing mechanism have been ordered..

Commercialization: Note that the commercialization activities are not funded under the contract and, instead, are included as part of the Resource Matching contained in the proposal. Ball Aerospace has already exceeded the promise investment of discretionary funds into commercialization activities. Work on commercialization is ongoing.

Delivery Milestone D15. Task T11, Procure Receiver and Detector Components (Accomplished): The main optical element, the final outstanding component, was received in January. So, this milestone is now complete.

Delivery Milestone D16. Task T20, Industry Conference Paper and Presentation (Not Accomplished): This milestone was placed on the schedule as a placeholder. We believe that test results from the initial lab demonstration are needed before an abstract and paper for an industry conference should be put forward. We are considering the American Petroleum Institute pipeline industry meeting in April of 2015 as a presentation forum.

Delivery Milestone D18. Task T4, Procure Laser Transmitter Components (Not Accomplished): This milestone was planned for Q5 and is now delayed into Q7. As reported previously, the laser supplier encountered a series of technical issues starting in July of 2014 (and reported as issues in the various monthly reports). Specific corrective actions are being implemented to improve the insight and oversight of this part of the development. Technical support is being offered where appropriate. Laser completion is now anticipated in April of 2015, in Q7 of the project.

Delivery Milestone D32. Task T23, Initiate Pointing Control and Geo-Location Software Development (Not Accomplished): This activity has not yet been started. Software engineers have suggested that the development will go faster if we wait for the WASM hardware to be available in the lab.

Delivery Milestone D33. Task T24, Start Wide Angle Steering Mirror (WASM) Fabrication (Accomplished): WASM drawings have been reviewed and updated to account for lessons-learned and notes from the next earlier build. The complete set of drawings is now tied to the ALDL project (BATC project # 34057). Procurement and fabrication of all components is underway except for the actuators. .

3.0 Schedule

The ALDL project remains on schedule. **Figure 2**, on page 6, presents the project schedule. The plan is shown by the blue bars. Completed tasks are shown in green. Delayed tasks are highlighted by yellow bars where schedule slack is being consumed and a red bar where schedule impact is being incurred. The vertical red line on the schedule shows the current date.

4.0 Payment Milestones

Payment milestones D15, D21 and D32 will be submitted for the fifth Quarter as summarized in Section 2.

Milestones D16, D18, D23 and D33 are delayed and will not be submitted for payment. Of these, only D18, which remains incomplete pending delivery of the lasers, is having an impact on the overall project schedule. Milestones D16 (industry conference presentation) and D23 (Annual Peer Review) are not in series with instrument development and test. The last milestone, D33, is the start of pointing control software development which is being delayed until relevant hardware items are available. This delay is intentional to improve the efficiency of the software development.

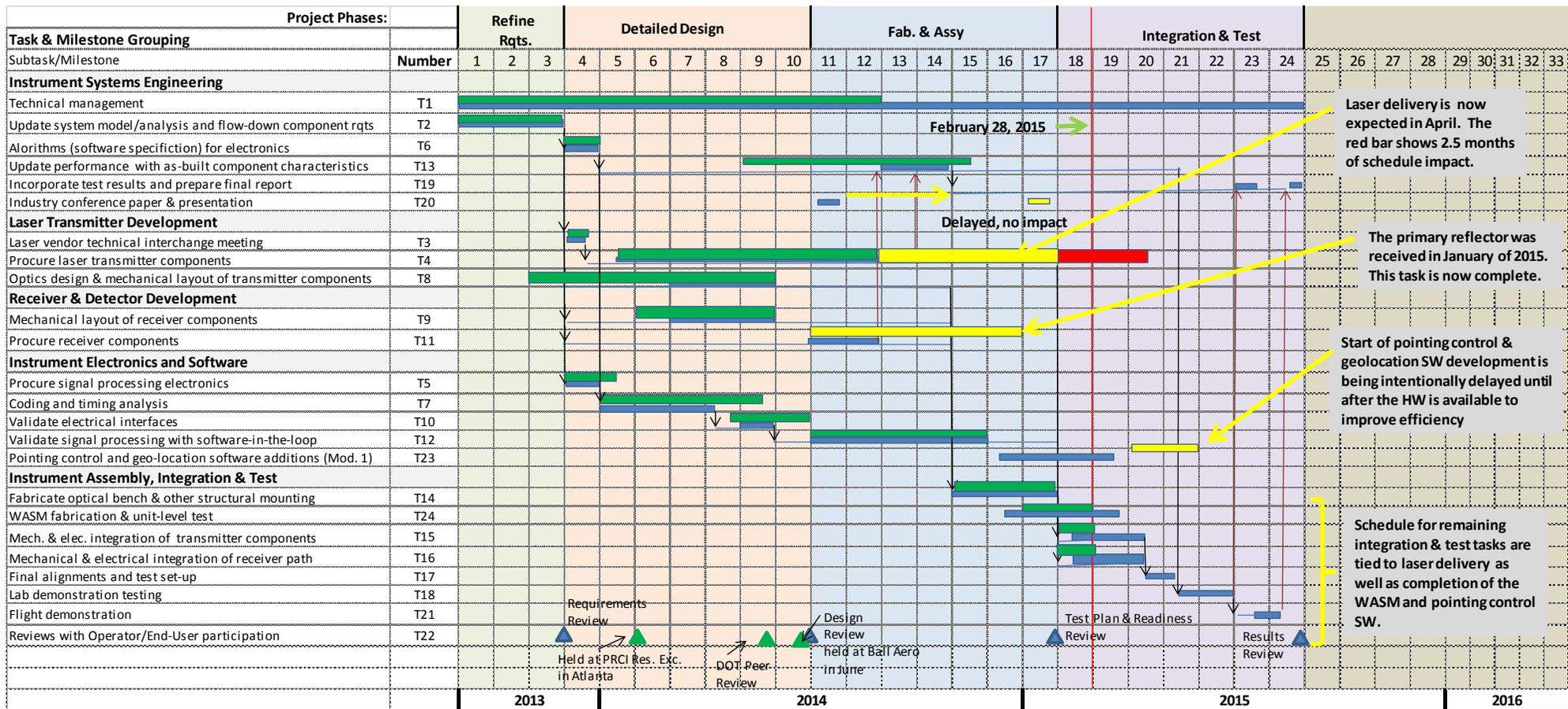


Figure 2, Advanced Leak Detection Lidar (ALDL) schedule progress against plan. Green bars indicate work accomplished. Yellow and red bars indicate delays. The vertical red line marks the end of the sixth quarter of the project (i.e. February, 2015). The schedule and list of tasks has been updated to account for Modification #0001. The tan period after the Integration and Test phase is included in the project period of performance and may be used for enhanced testing or refinements of the ALDL technology.

