
Statement of Work

Heat Pipe Solutions

Widefield Context Camera- Thermal Management System

Teledoc Link: [stp202606_0002](#)

Repository: <https://gitlab.sc.ascendingnode.tech:8443/stp/um/wcc/wcc-datasheets>

Branch: refs/pipelines/2598 | **Commit:** 0104cb5

For access to the repository contact douglase@arizona.edu

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Signatures

Signature: _____

Date: _____

Principal Investigator

Signature: _____

Date: _____

Chief Engineer

Signature: _____

Date: _____

Thermal Engineer

Signature: _____

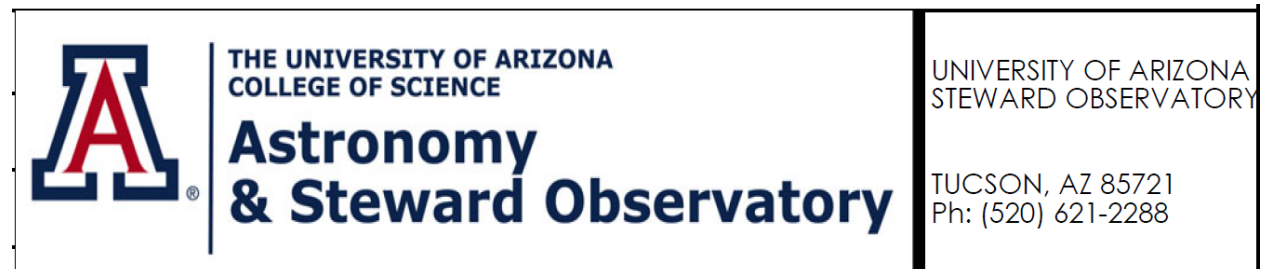
Date: _____

Optical Scientist

Signature: _____

Date: _____

Systems Engineer



1 Scope

This document captures the contents required to produce and procure a passive thermal management system that will be utilized to effectively cool the Widefield Context Camera (WCC) assembly with line-item deliverables upon PO submission and acceptance. The system is expected to be comprised of a heat spreader plate, three (3) heat pipes, and a thermal interface plate with the design pending UA and supplier negotiation. The system shall comply with the heat pipe mechanical and thermal performance requirements as defined in [section 5](#). Initial concept of the thermal management system is shown in [section 6](#).

2 Introduction

The University of Arizona (UA) Center for Astronomical Adaptive Optics (CAAO) requests a quotation for producing a heat pipe-based solution for the WCC.

3 Period of Performance and Supplier Expectations

Vendor schedules shall begin with receipt of the purchase order. The vendor shall confirm the initial proof of concept, shown in [Figure 1](#) thru [Figure 3](#), and provide any design suggestions and updated mechanical interfacing requirements for the heat pipes. The vendor shall perform qualification testing on the system to confirm system level performance as defined in [Table 2](#). The vendor schedule shall end with the delivery of the heat pipes to The University of Arizona; specific delivery location provided upon delivery request. The vendor shall be responsible for safely packing and protecting the finished hardware. The vendor shall assume responsibility for the risk of shipping.

4 Deliverables

During initial RFQ and end delivery, deliverables shall be IAW to [Table 1](#). During initial RFQ the vendor is requested to provide the general cost and schedule for hardware delivery in addition to cost and schedule options for expedite that lists the expedite fee and reduced schedule, if applicable.

Table 1: SOW Deliverables

Line Item	QTY	Description
01	1	Analysis: Proof of Concept Validation
02	1	Test: 1-g Performance Verification – Qualification Test
	1	Qualification Test Plans – Approved by UA
03	1	Design: Heat Pipe Prescription @0-g Performance
04	1	Supporting CAD Model(s) – Universal File Formatting

Line Item	QTY	Description
05	3	Delivered Hardware Units
	2	Flight Unit and Spare Flight Unit
	1	Flight-like, Nonfunctional, Qualification Test Unit
06	1	All Analyses Reports
07	1	All Applicable Test Reports
08	1	Quality Assurance: Heat Pipe Assembly Documentation and
	1	Certificates
		Material Identification Usage List

5 Requirements

The heat pipe is suggested to meet the following requirements within [Table 1](#):

Table 2: Preliminary Heat Pipe Prescription

Requirement	Value	Comment
Mechanical		
Material	Al6061-T6	Requiring vendor confirmation on spec.
Working Fluid	Ammonia	
Wick Design	Homogeneous	Requiring investigation to confirm 1g and 0g performance
Outer Diameter (Do)	1/2in	Requiring supplier validation
Vapor Core Diameter (Dv)	TBC	
Internal Diameter (Di)	TBC	
Transport Length (L) [end-to-end]	~1.2m	Preliminary CAD models with pipe routing
Evaporator Length (Le)	~18-19in (0.45-0.48m)	Requiring supplier confirmation
Condenser Length (Lc)	~18-19in (0.45-0.48m)	Requiring supplier confirmation
Thermal Interface Plate Dimensions	4.55in x 18in x 0.35in	Nominal dimensions
Heat Spreader Dimensions	8.0in x 18.6in x 0.28in	Nominal dimensions
Expected Lifetime Performance	5 Years MIN	Mission requirement
Thermal		

Requirement	Value	Comment
FLIGHT – Operating Temperature	-22.5C+/-2.5C	Temperature at cold interface. Estimate as of 20260611.
QUAL – Operating Temperature	-35C (MIN) / +55C (MAX)	Qualification Temp.
QUAL – Non-Operating Temperature	-45C (MIN) / +65C (MAX)	Qualification Temp.
Thermal Load	200W MAX	67W per pipe
Temperature Uniformity (ΔT)	5C MAX	Delta temperature between evaporator and condenser.
Thermal Stability	200mK/hr	Aligns with system level stability performance.

6 Working Thermal Management [CDR] Design

The thermal management system has been designed to effectively cool an array of cameras. It's been shown, during marginal operation, that the cold interface could be expected to dissipate upwards of 200W. This estimated power can be seen in the heat map, part of [Figure 1](#).

The underside view of the heat spreader, [Figure 2](#), shows the general layout of the pipes placed on the heat spreader plate. It's currently assumed that the heat pipes would be embedded, within the heat spreader and the thermal interface, with conductive thermal epoxy. Partly shown in [Figure 2](#) and better shown in [Figure 3](#) is the direction of the heat pipes coming from the heat spreader to the thermal interface. The heat pipes have been staggered to allow for optimal integration within the confines of the WCC packaging. Thru holes on the heat spreader are to be expected for mating hardware and feedthroughs for cabling.

NOTE: The placement of the heat pipes on the thermal interface is a placeholder pending system level input on interfacing conditions of connecting hardware.

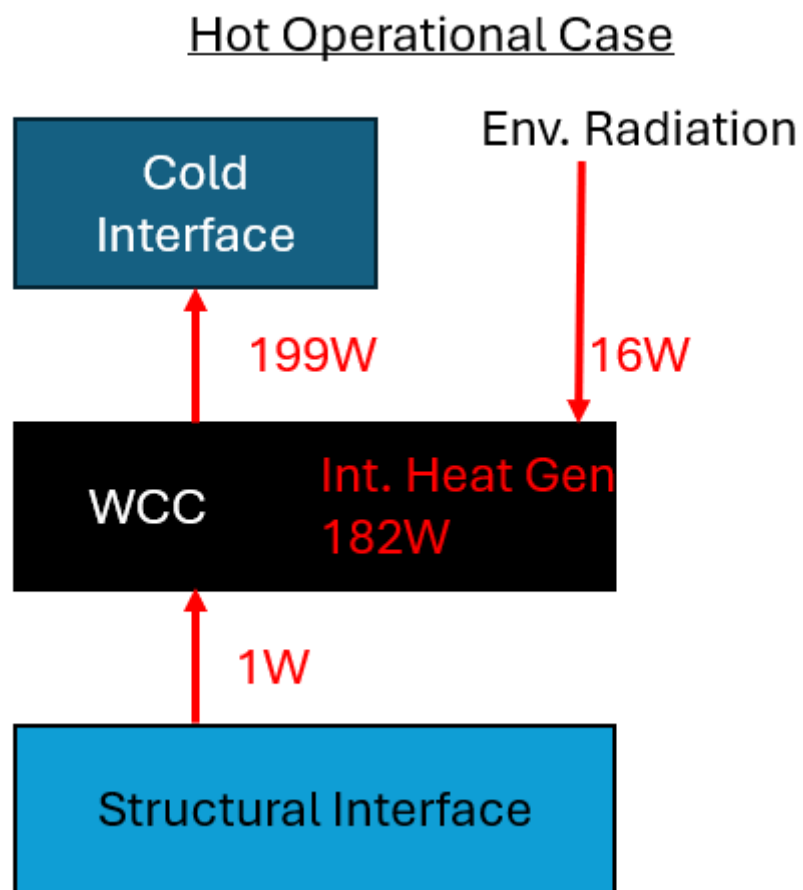


Figure 1: WCC Thermal Management Heat Map

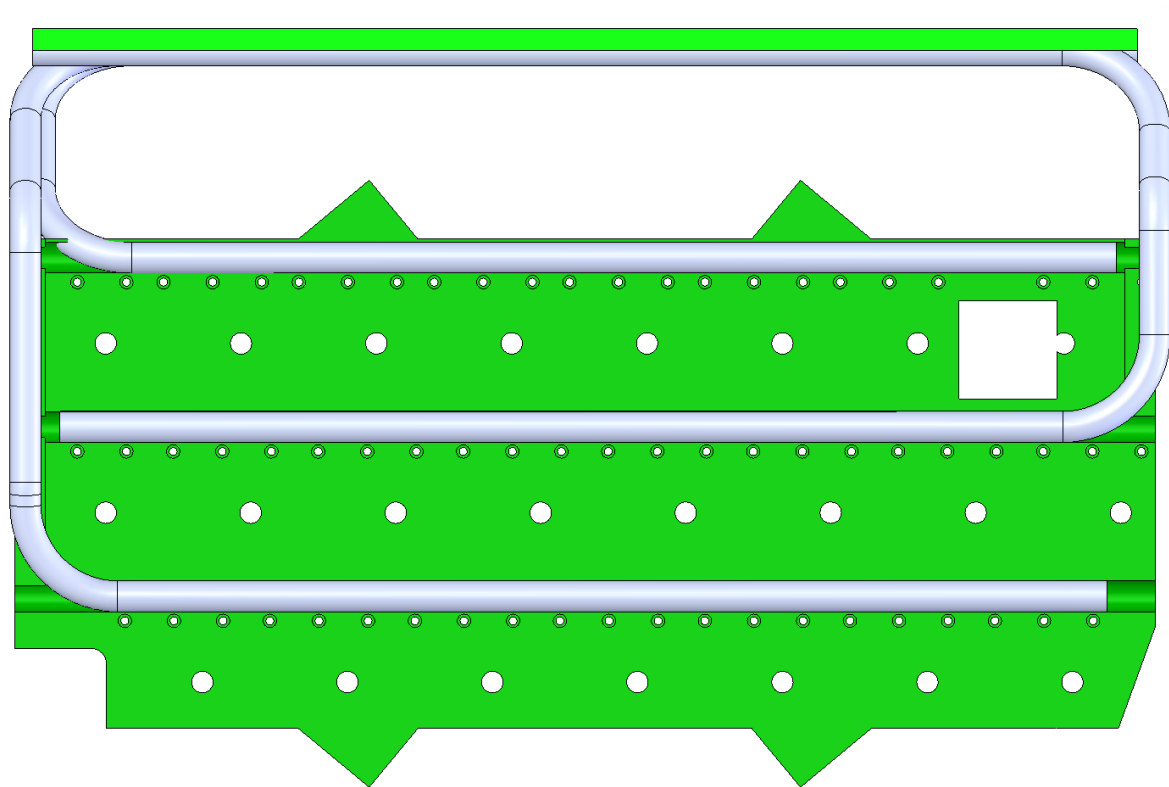


Figure 2: Underside view of the Heat Spreader

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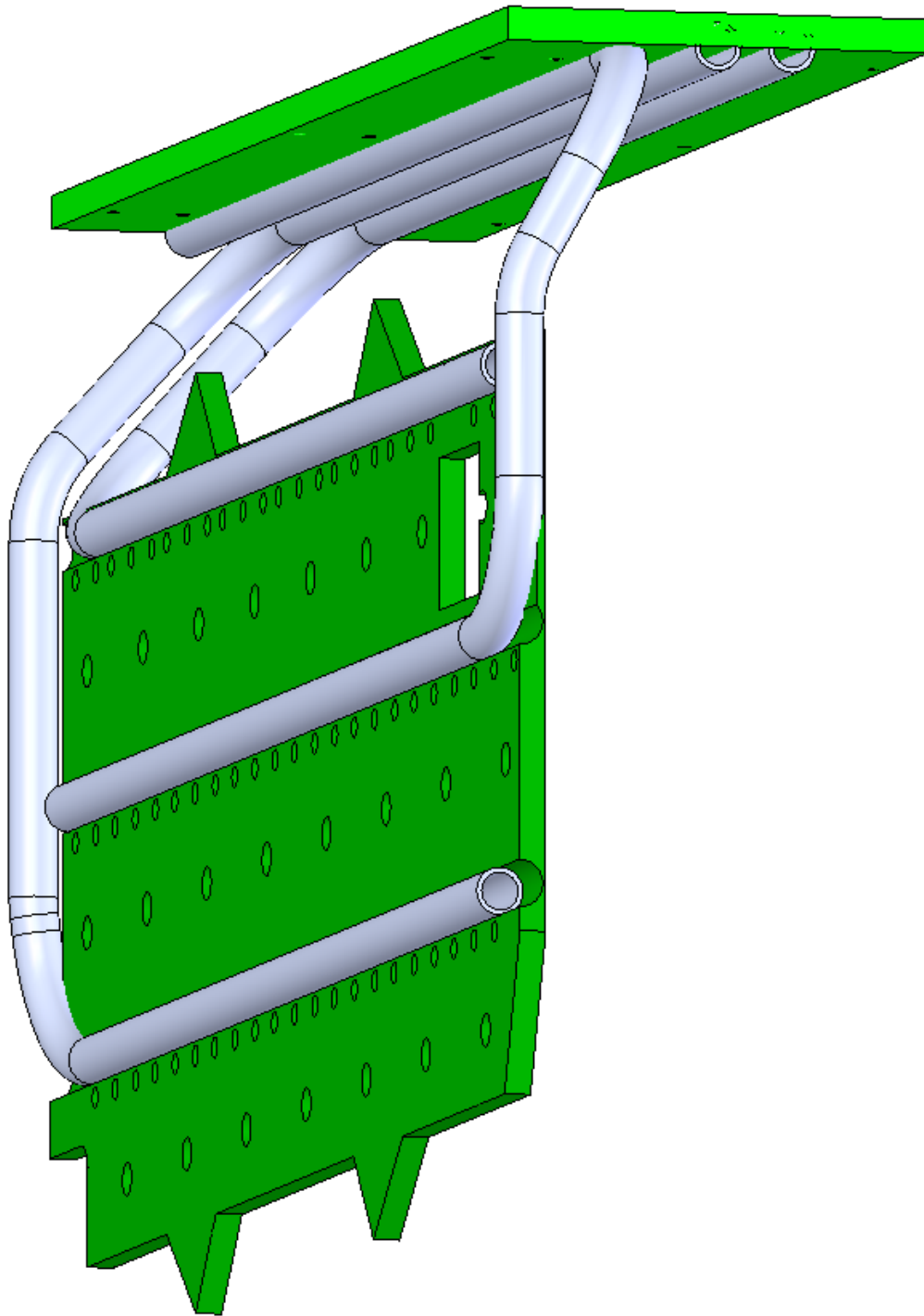


Figure 3: Thermal Management System - WCC not shown for clarity

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