Technical Reviewers' Rating Summary

Proposal Number G-025-03 Application Title TIG Grant Application Submitted By Talent Inspection Group Request For ~~$975,000.00~~ $125,000 Total Project Costs ~~$2,275,000.00~~ $650,000

Section A. Scoring

Statement	Weighting Factor	G-025-A7	G-025-A8	G-025-A9	Average Weighted Score
1. Objectives	9	**4**	**4**	**3**	**27**
2. Achievability	7	**4**	**3**	**3**	**21**
3. Methodology	8	**4**	**4**	**2**	**24**
4. Contribution	8	**5**	**4**	**3**	**32**
5. Awareness / Background	5	**4**	**3**	**2**	**15**
6. Project Management	3	**4**	**3**	**2**	**9**
7. Equipment / Facilities	2	**4**	**4**	**2**	**6**
8. Value / Industry - Budget	4	**5**	**4**	**3**	**16**
9. Financial Match - Budget	4	**4**	**3**	**3**	**12**
Average Weighted Score		**212**	**181**	**132**	**175**
	Total: 50				**250 possible points**

OVERALL RECOMMENDATION

FUND	**X**	**X**	
FUNDING TO BE CONSIDERED			**X**
DO NOT FUND			

Section B. Ratings and Comments

1. The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Oil and Gas Research Council goals are:

   Applicant should review requirements of CFR 49 Parts 192 and 195 to establish an understanding of current pipeline regulations With special attenttin to the Scope; Pipeline integrity and unusually sensitive areas paragraphs.
   - Reviewer: G-025-A7
   - Rating: 4

The use of these technologies is also being looked at by the Pipeline Research Council International (PRCI) RAM project. FAA limitations on the use of unmanned aircraft have made it difficult to gain industry support at PRCI. Improvements in sensor technology including reducing the size and weight are important if using UAS's.
- Reviewer: G-025-A8
- Rating: 4

Ideas are clear and very good, but project needs more technical focus.
- Reviewer: G-025-A9
- Rating: 3

Great points, we feel North Dakota and the University of North Dakota are positioned well within the US and within the FAA to become one of the first states to have NAS opened for such commercial use testing in the United States. TIG will utilize our relationship with UND for COA's for our issuance of (white papers) for FAA compliance and proof of concept. A great point is size and weight, we feel the technology has outgrown legislation and that is where being positioned in North Dakota, having DOT, FAA and Washington contacts will keep TIG on the forefront of the pipeline industry as testing proves positive results needed for commercialization. The FAA re-authorization and reform act (H.R.-658) is being watched closely. The true value-add here is showing the industry support for disseminating the data and creating valuable dialogue between the pipeline companies and inspection group. The data acquisition and mining is enabling the pipeline companies to comply withCFR Part 49 192.705 and 192.709, and the logging and dissemination of this data will yield increased response times. We will show this tangible in our appendix with a letter of support from within the pipeline industry. The use of TetraCam and Cloud Cap TASE sensors will bridge the gap between manned and unmanned platforms. This will enable technical developments to be acheived and implemented aboard a manned aircraft, while also enabling parallel R&D on an unmanned platform. These sensors in particular will be ideal for detecting surface anomalies (such as unhealthy or changes in vegetation and soil). Correlating these anomalies to pipeline leaks and failure modes will be achieved in the data mining initiatives.
- Applicant

2. With the approach suggested and time and budget available, the objectives are:

Much of the technology required exists, therefore this effort would be developing a new application of existing technology.
- Reviewer: G-025-A7
- Rating: 4

The timelines seem aggressive in Phase I, but reasonable in the other Phases. Budget may be a little light but partnering with UND may be helpful. PHMSA may also have additional dollars available since recently pulling funding from some joint industry/government research initiatives due to political pressures.
- Reviewer: G-025-A8
- Rating: 3

Need to focus on 1 or 2 technologies to demonstrate this method of pipeline surveilance. Work more on obtaining imagery reliablility and accurately processing imagery for detection and comparison, and work less on the reports and "gee whiz" possiblities that are cited.
- Reviewer: G-025-A9
- Rating: 3

TR is absolutely right in that the proposed technology is currently available, however, implementation aboard UAS for pipeline monitoring is novel. The TetraCam MCA6 is capable of detecting soil disturbance and differences and surface anomalies along a right of way. This sensor, along with the TASE line of gimbal sensors from Cloud Cap Technology, are ideal pipeline monitoring sensors for this proposal because of their modularity between man and unmanned platforms. These technologies will initially be implemented on a manned platform for immediate implementation, Parallel efforts at UND will focus on implementing these technologies aboard flights can be pursued within their COA's, and the results and efficiency of operation can be demonstrated and logged for FAA reports (white papers). This will create an industry backing of the technology, while demonstrating its efficacy. The result of which will position TIG to introduce the sensors aboard UAS for commercial applications in the oil and gas industry. The technological focus will be directed towards imaging and video sensors for surface monitoring. These indeed are currently available technologies, but the proliferation of these technologies for enhanced monitoring in the oil & gas industry is a novel effort. Aggressive yes, we feel we can attain these goals with the legislation being implemented, industry support, our team's experience, and UND's capability in payload development and aeronautics operation will bring reliability to the flight and data capture initiatives. Google Earth will be researched as a tool to be used for streamlined data analysis. PHMSA grants will be looked into as we go forward. It starts with this initial funding and look forward to streamlining pipeline applications, increasing admissions at UND and creating jobs within North Dakota.
- Applicant

3. The quality of the methodology displayed in the proposal is:

Their process is well thought out.
- Reviewer: G-025-A7
- Rating: 4

Within the report it is stated several times that they will be able to detect ruptures. I don't believe the goal is to identify ruptures. Ruptures on high pressure gas or liquid pipelines are generally self-evident. These technologies are intended to identify leaks, encroachments, unauthorized excavation and the monitoring of geotechnical & hydrotechnical issues. Satellite technology is also being research heavily to perform similar functions.
- Reviewer: G-025-A8
- Rating: 4

Need to focus on 1 or 2 technologies. Application takes a shotgun approach to different sensors and technology ("ground penetrating radar? Really?) Focus on what you are looking for i.e. encroachment on the pipeline ROW and focus on imaging technology that will detect

encroachment. Or, focus on land movement (slides) and find one technology or sensor that will detect movement. (Difficult in a moving airplane).
- Reviewer: G-025-A9
- Rating: 2

Correct, focusing on ruptures will not be the primary focus. Leaks, encroachments, excavations, GIS and hydro-technical issues. We feel the current legislative timeline forecast for the FAA and being within North Dakota air space is a competitive advantage for TIG. We agree on focusing on our "value add" to our industry customers. We have the capability to fly at various speeds and with rapidly changing technology we feel sensor speeds will vary from loitering to fast as needed by our industry customers. See above for relevance to a more focused technical effort. Achieving reliable flight operations with accurate data capture is not a trivial task, but there is none better than the Unmanned Aircraft Systems Engineering (UASE) Laboratory and the UAS Program at the University of North Dakota to aid in carrying out this task.
- Applicant

4. The scientific and/or technical contribution of the proposed work to specifically address North Dakota Industrial Commission/Oil and Gas Research Council goals will likely be:

   There is potential to improve resposne times to potential incidents and to reduce costs and improve safety.
   - Reviewer: G-025-A7
   - Rating: 5

   Monitoring pipelines and change in conditions around a pipeline are difficult. The ability to integrate data into a pipeline operators data sets will be key in it usefulness.
   - Reviewer: G-025-A8
   - Rating: 4

   No Comment
   - Reviewer: G-025-A9
   - Rating: 3

   True that change can be challenging. This idea started from a public conscience and awareness and now being validated within the FAA and pipeline industry governing bodies. Integrating the data into an easy to interpret Google Earth Interface will provide a forum where inspectors can access all of the relevant data at the tips of their fingers
   - Applicant

5. The background of the principal investigator and the awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is:

   They have the right people involved in the project.
   - Reviewer: G-025-A7
   - Rating: 4

Refer to comments above.
- Reviewer: G-025-A8
- Rating: 3

Team seems to have decent aviation experience, but limited pipeline and oil industry experience. Also need to thoroughly review other pipeline surveillance research of all types before proceeding. There are other projects testing surveillance sensors, etc.
- Reviewer: G-025-A9
- Rating: 2

We feel we have the qualified individuals involved and have had tremendous response from our data collection and pipeline engineering partners. We also agree there are other projects under way and are keeping our eye on the industry competition within the US and beyond.
- Applicant

6. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any, is:

The plan is well developed.
- Reviewer: G-025-A7
- Rating: 4

No comment
- Reviewer: G-025-A8
- Rating: 3

Again, some technical focus is needed. Also, be more clear and focused as to your clients, not just "stakeholders" or "all sectors". Are you targeting the pipeline companies? Regulators? I see the need to get a pipeline company partner early in the project, for technical and practical input and just to have (permission to fly) a pipeline route to practice on.
- Reviewer: G-025-A9
- Rating: 2

We agree completely that a pipeline partner is crucial. We are in talks and will have an industry support letter of intent included in this grant. We have and will continue to have discussions on oil/gas ROW opportunities for flight testing within North Dakota.
- Applicant

7. The proposed purchase of equipment and the facilities available is:

The items specified are necessary for the successful completion of the project.
- Reviewer: G-025-A7
- Rating: 4

No comment
- Reviewer: G-025-A8

- Rating: 4

This is a good idea with a lot of commercial merit.
- Reviewer: G-025-A9
- Rating: 2

Thank you, and as mentioned in earlier comments, UND will be a great resource for access to items such as manpower and capital equipment. This again is crucial for this to be a success (please see support letter in appendix).
- Applicant

8. The proposed budget "value"1 relative to the outlined work and the commitment from other sources is of:

Having both indudstry and financial support will ensure the projects completion.
- Reviewer: G-025-A7
- Rating: 5

No comment
- Reviewer: G-025-A8
- Rating: 4

Seems reasonable.
- Reviewer: G-025-A9
- Rating: 3

We will have industry support and appreciate your feedback. We also have the capital backing to fund this viable venture. I will stress industry commitment or support will be garnered for the response review. This will be in the appendix.
- Applicant

9. The "financial commitment"2 from other sources in terms of "match funding" have been identified:

Very good financial backing.
- Reviewer: G-025-A7
- Rating: 4

Other funding may also be availible through PHMSA.
- Reviewer: G-025-A8
- Rating: 3

No further comment.
- Reviewer: G-025-A9
- Rating: 3

Agree, We have and will continue to explore financing options. As mentioned it starts with this opportunity and we are proud to represent the OGRC, UND, the pipeline industry and the state of North Dakota in the future.
- Applicant

1 "value" – The value of the projected work and technical outcome for the budgeted amount of the project, based on your estimate of what the work might cost in research settings with which you are familiar. A commitment of support from industry partners equates to a higher value.

2 "financial commitment" from other sources – A minimum of 50% of the total project must come from other sources to meet the program guidelines. Support less than 50% from Industrial Commission sources should be evaluated as favorable to the application; industry partnerships equates to increased favorability.

General Comments

The research addresses a current and future need, therefore the benefits of successful completion of this project are very significant both financially and fromsafety standpoints. I would encourage the researchers to involve pipeline operating companies, including both liquids and gas companies; in the review process as the work progresses.
- Reviewer: G-025-A7

The proving of technologies used will be key in the success of the initiative. Access to the data library and ability to easily identify change from previous images or sensors geospatially will be critical in making it a useful tool for pipeline operators. Overall all I think it is a good project and advancing the associated technologies will provide pipeline operators with an additional tool in the tool box. Satellite technology may have advantage aerial surveillance in the fact that it can be more frequent (real-time) and are not under FAA limitations.
- Reviewer: G-025-A8

Overall this is a great idea. Any means to do pipeline surveillance, more frequently, with less cost (unmanned), more accurately (digitally), recored and archived, is well worth the study. Fully developed and reliable, the pipeline industry would find this very useful.
- Reviewer: G-025-A9