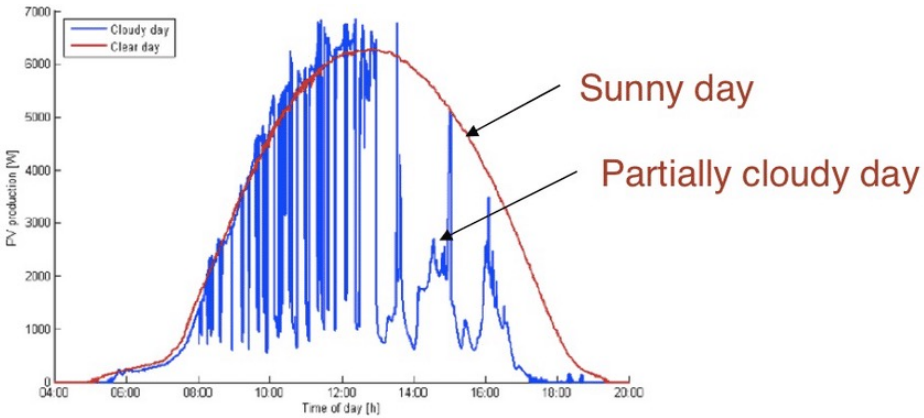


TelemeTrak

Buffering Ups and Down in Power Generation to Cut Waste and Costs

Most renewable power sources are not stable.

- Solar power, for example, is only stable in perfect weather.
  - It varies by 10 or even 100X when clouds block the sun.

Today's systems are designed for average conditions. unstable.

- They "clip", "curtail" or, simply put, waste above average power,

TelemeTrak eliminates waste by buffering above average power when it's generated, for later use.

- We reduce the number of batteries and solar panels needed in places with varying weather.
  - That's most of the planet.

Erik Eklund, CEO erik@telemetrak.com +1-415-335-3436

TelemeTrak

Tagging, Tracking and Locating (TTL) of Unpowered USAF Assets

Contract Number: FA864921P1093 (Ph. I AFWERX SBIR)

CAGE Code: 8KD52

Update **20 Sep 2021**

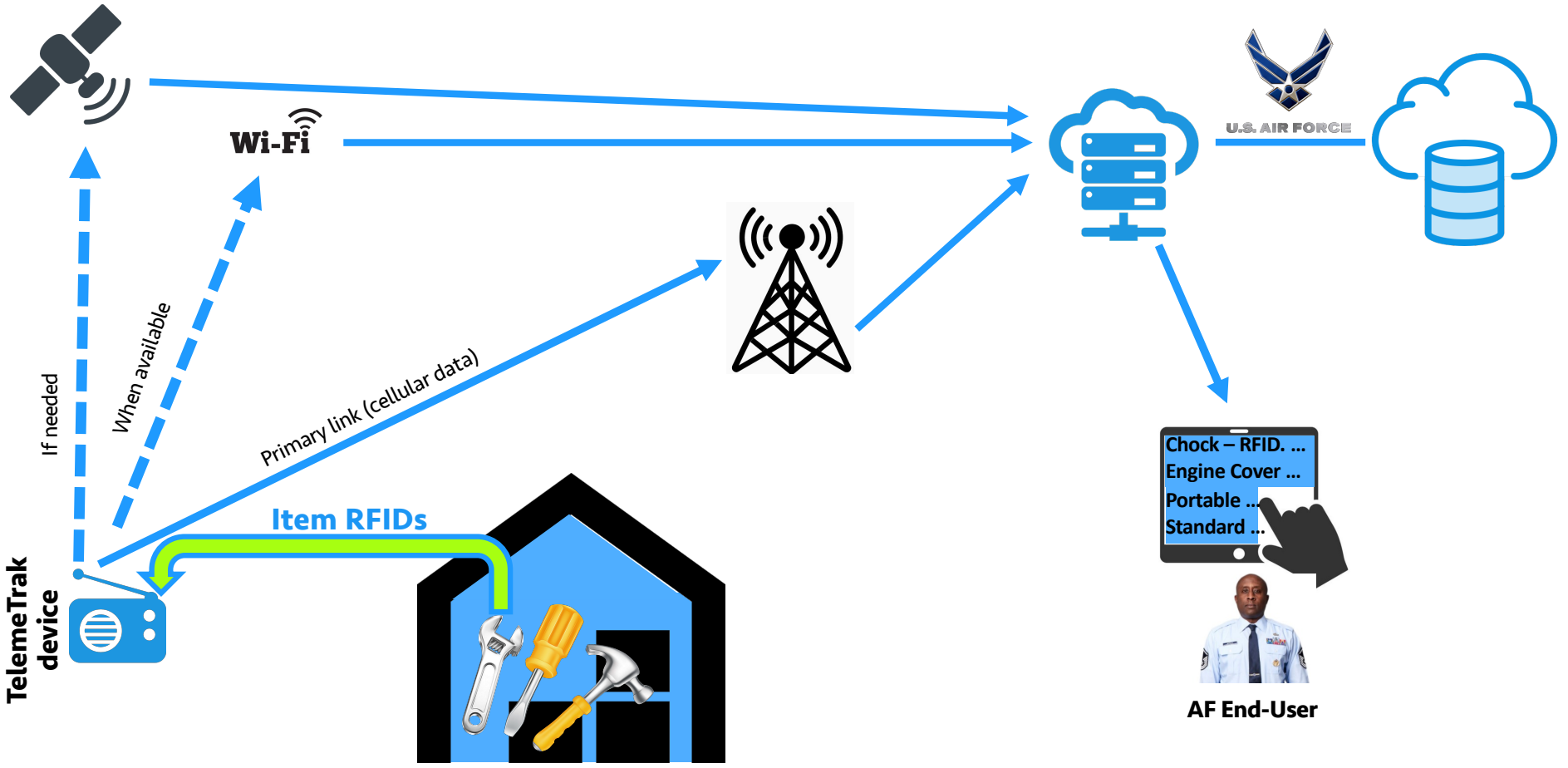
Erik Eklund, CEO erik@telemetrak.com +1-415-335-3436

TelemeTrak

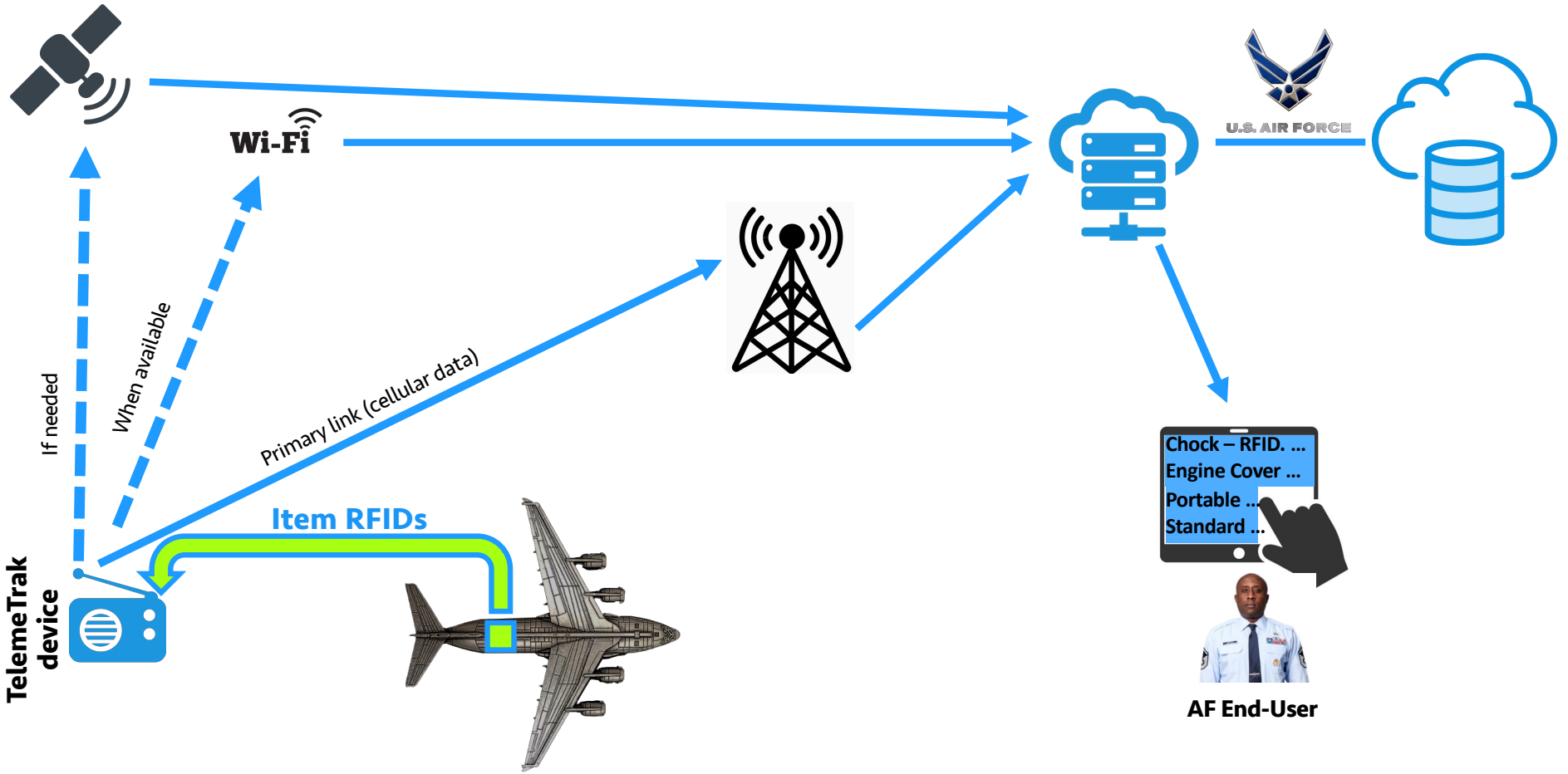
Contents:

1. Two Solutions Proposed: 437th AMXS Tool Room and OBLE
2. Initial Lab Test Results
3. Preliminary User Interface Ideas
4. Questions for the 437th AMXS
5. Draft Phase II Workplan
6. Appendix

TelemeTrak RFID Detection: Tool Room Inventory

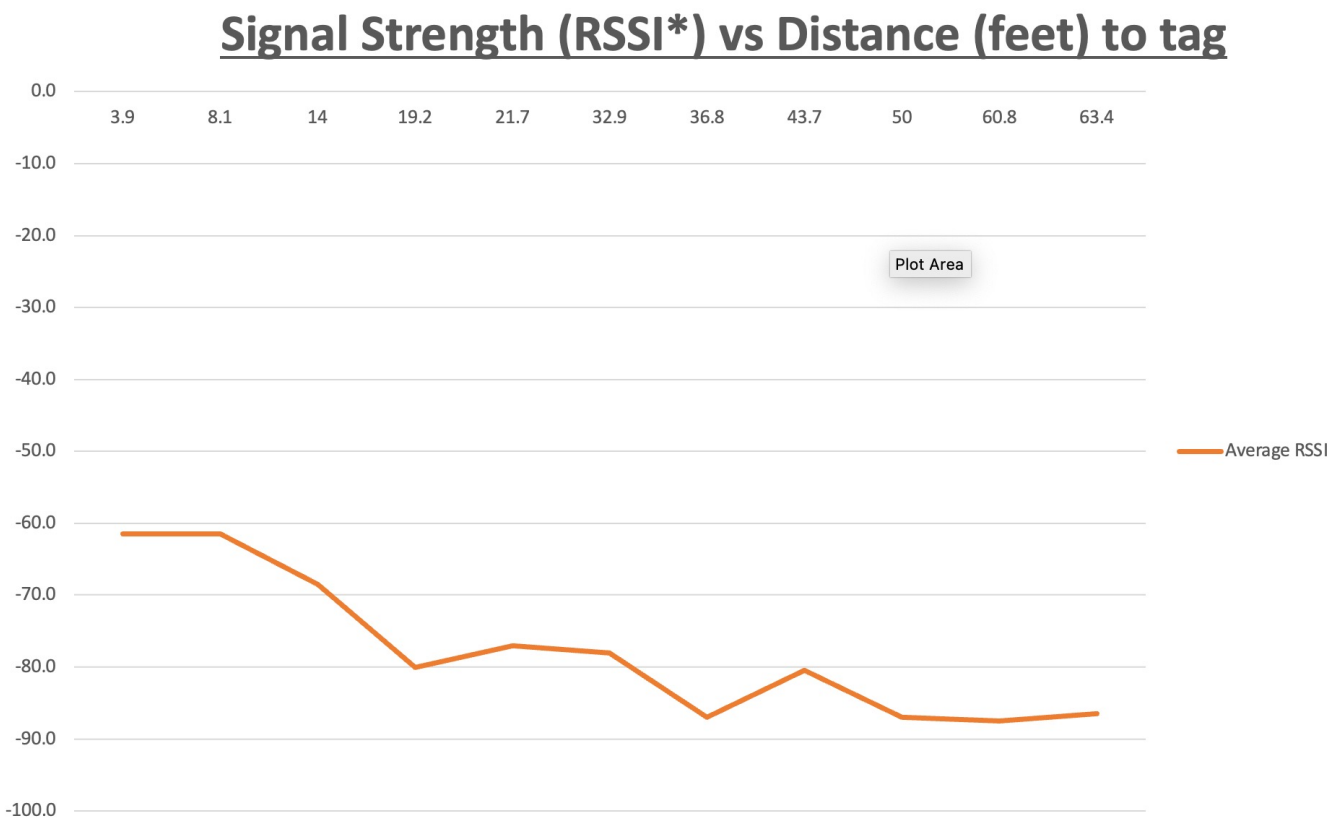


TelemeTrak RFID Detection: C-17 OBLE*



* OBLE = on-board lose equipment, e.g., engine covers. Typically, a C-17 carries about 50 such items.

Initial Lab Test Results



* "Received signal strength indication"
**No signal received at 70 feet. 63.4 feet was the greatest distance with any signal.

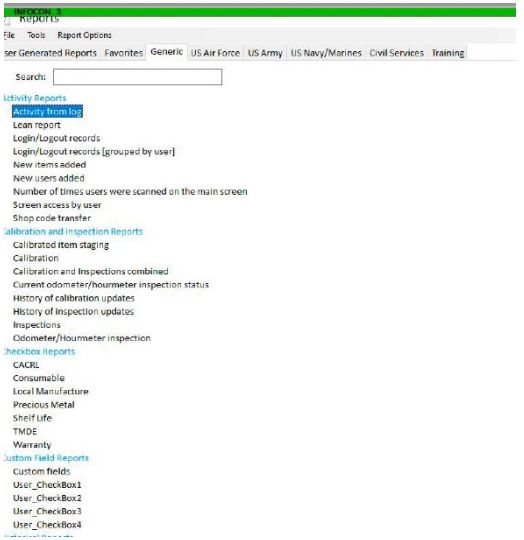
Preliminary User Interface Ideas

We plan to use current 437th AMXS formats and nomenclature*

- We have some screenshots of the TCMax (tool control software) user interface.
  - Using the TCMax "look and feel" won't win the Oscar for "best new UI". But, it should reduce errors, simplify things and make training easier, because many users should already be familiar with it.
  - That said, we'd welcome any suggestions for UI improvements.

Event Type	Barcode Id	Description	Shop Code	Location	Event	Username	Quantity	Logged In	Expected
ssue	CLASD3430	DTOS LAPTO...	CLAS	GOLD 6	7/8/2021 10:...	Brown, Jame...	1	Shashaty, Al...	
ssue	CLASAPG01	APG TOOL BOX	CLAS	GOLD 6	7/8/2021 10:...	Brown, Jame...	1	Shashaty, Al...	
urnIn	CLASapg03	APG TOOLBOX	CLAS	GOLD 6	7/8/2021 10:...	Brown, Jame...	1	Shashaty, Al...	
ssue	CLASCBC22	CIRCUIT BRE...	CLAS	GOLD 6	7/8/2021 10:...	Brown, Jame...	1	Shashaty, Al...	
ssue	CLASapg03	APG TOOLBOX	CLAS	GOLD 6	7/8/2021 10:...	Brown, Jame...	1	Shashaty, Al...	
icannedUser			CLAS		7/8/2021 10:...	Brown, Jame...	0	Shashaty, Al...	
ssue	CLAStrp04	T.R. PIN W/ L...	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
ssue	CLASrbt16	Radio Battery	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
urnIn	CLASrbt16	Radio Battery	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
ssue	CLASFL038	DeWALT LED ...	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
ssue	CLASrbt16	Radio Battery	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
ssue	clasrad16	RUGGED RA...	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
ssue	CLASPPG03	1C-17A-2-71J...	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
ssue	CLASd3413	DTOS LAPTO...	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
ssue	CLAS14109	EMPTY TOOL...	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
ssue	clasjet04	JET BOX	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
ssue	CLAS01120	ENGINE INLE...	CLAS	gold 7	7/8/2021 10:...	Watkins, Brett	1	Shashaty, Al...	
icannedUser			CLAS		7/8/2021 10:...	Watkins, Brett	0	Shashaty, Al...	
ssue	clasfl045	Dewalt Spotl...	CLAS	-21	7/8/2021 10:...	McCraw, Billy	1	Shashaty, Al...	
ssue	clasfl046	Dewalt spotl...	CLAS	-21	7/8/2021 10:...	McCraw, Billy	1	Shashaty, Al...	
ssue	CLASbat15	BATTERY 20V	CLAS	-21	7/8/2021 10:...	McCraw, Billy	1	Shashaty, Al...	
ssue	CLASbat13	BATTERY 20V	CLAS	-21	7/8/2021 10:...	McCraw, Billy	1	Shashaty, Al...	
icannedUser			CLAS		7/8/2021 10:...	McCraw, Billy	0	Shashaty, Al...	
CompletedI...	CLASADK05	AFIN DAILY KIT	CLAS		7/8/2021 10:...		1	Shashaty, Al...	
ssue	clasBAT12	BATTERY 20V	CLAS	blue 6	7/8/2021 9:4...	Williams, Av...	1	Shashaty, Al...	
TurnIn	CLASBAT10	BATTERY 20V	CLAS	blue 6	7/8/2021 9:4...	Williams, Av...	1	Shashaty, Al...	
ssue	clasfl049	Dewalt Spotl...	CLAS	blue 6	7/8/2021 9:4...	Williams, Av...	1	Shashaty, Al...	

Event Logs



* How standard are those formats and nomenclature across the AF? Across DoD?

Questions for the 437th AMXS (1 of 2)

1. What type of device(s) does the 437th AMXS want to read the data on?
   - A PC? A mobile device? If so, which one?
   - A browser-based solution might be the best, as various devices can use it.
2. Can TelemeTrak install our solution in the 437th AMXS tool room*?
   - Or, does someone else have to do the installation (for security or other reasons)?
     - If so, who else would do the installation?
     - TelemeTrak would prefer to install our solutions.
       - But, we can also train someone else to do that, if needed.
3. Is WiFi available in that tool room?
   - If not, can we add WiFi?
4. What DoD regulations apply to RFID frequencies?
   - We're researching this, but any hints you might have would be very welcome.**

* That's the tool room in question. Right?

** TRANSCOM seems to prefer 860-960 MHz for tracking cargo, But tools and OBLE are not cargo. Right?

Questions for the 437th AMXS (2 of 2)

5. What data security requirements are applicable?
   - Will we be working with any classified data, at least in the initial (tool room and OBLE) use cases?

6. Who can sign the Phase II Customer Memo* (the "memo of understanding") as:
   a) Point of contact for the Primary **End-User** Organization
      - *("the organization that stands to operationally benefit from the solution")*
        - This POC is often an **O-5****;
   b) Point of contact for the Primary **Customer** Organization
      - *("the organization that is responsible for acquiring the solution on behalf of the End-User")*
        - This POC is often an **O-6**;
   c) **Lead** end-user Technical Point of Contact (**TPOC***);
      - MSgt Riddell or MSgt Berk? (only one is needed); and
   d) **Alternate TPOC**;
      - TSgt Valdez?

7. How does the draft Phase II workplan (on the next three slides) look?

* The "21.1 MoU" template should be available by 30 Sep 2021, but erik@telemetrak.com has and can share a template from 2019. He anticipates limited changes.
**. The "end-user" must have the "authority to obligate TPOC support", i.e., must be able to authorize the TPOCs supporting the proposed initiative.
*** Note that TelemeTrak will not much of the TPOCs' time (mostly feedback and access to the tool room and a C-17 (birefly) for testing).

Draft Phase II Workplan (1st of 3 slides)

5 Stages

- Each involves at least some time at the 437th AMXS at JB Charleston.
  - But, we won't need much hand-holding beyond:
    - access to the tool room (for testing and installation); and
    - a C-17 (for a few hours of evaluation and testing of our handheld solution);
      - we're not planning to install anything in a C-17.
- Probably 3 months for each stage;
  - each roughly one fifth of the period of performance (typically 15 months in total);
    - the period of performance will be defined in the 21.1 SBIR Phase II Solicitation;
      - AFWERX now expects to release that on or about 30 September 2021.

Draft Phase II Workplan (2nd of 3 slides)

Stage 1

- **Test** (both in tool room and with a C-17):
  - 8 different **antennae**;
  - 6 different **sensors**; and
  - 20 different **tags**, in at least two frequencies:
    - 433 MHz ("UHF"), 850-950 MHz (also "UHF"), and/or 2.45 GHz ("Microwave");
  - 6 different **adhesives** (to glue RFID tags to a range of tools and OBLE)*
- Present (for 437th AMXS approval) **mock-ups of UIs** that we plan to build.
- **Confirm** nomenclature, format and other details. For example:
  - Does the 437th AMXS want a closed system (inaccessible from outside the AF)?**
    - Will TelemeTrak be able to support the system remotely?
  - Does the 437th AMXS wants one or more devices at JB Charleston that are either not on the Internet, or inaccessible from the Internet?
    - We can support devices that are not connected to the Internet, but connected to a closed Wi-Fi network, if needed.

* 2d Lt Boesiger requested "the strongest adhesive possible … lost items, even the absolute smallest like an RFID tag, are a huge issue on an aircraft as they could cause catastrophic interference with flight controls, engine intakes, etc." But, different adhesives work better on different surfaces, so we'll have to test.

** 2d Lt Boesiger explained that "TC Max … is a platform controlled by Air Mobility Command (AMC). AMC will not accept any additional inputs or modifications to the system from a civilian contract, so the software we require from you [TelermeTrak] will be completely new and independent."

Draft Phase II Workplan (3rd of 3 slides)

Stage 2

- Test the top two candidates for each of the two tracking solutions (tool room and OBLE).

Stage 3

- Install and test (for several days) the best ("productized") solutions (tool room and OBLE).

Stage 4

- Install the production ("ready for prime time") solution for each (tool room and OBLE);
- leave these operating for at least 2 weeks;
- check performance remotely (or by email, if security won't allow data to leave the base) to make sure everything is working; and
- return to the 437th AMXS to address any issues.

Stage 5

- Present final report and leave tool room and OBLE solutions in place.

TelemeTrak

APPENDIX

Erik Eklund, CEO erik@telemetrak.com +1-415-335-3436

RFID Terminology

The main **UHF** (ultra-high-frequency) RFID systems that we use are in the 466 MHz and 860-960 MHz bands.

- **466 MHz** tags are usually active, meaning they both have batteries and transmit their ID periodically.
  - This could eliminate 466 MHz tags an option for OBLE. But, they could work well in the tool room.
- **860-960 MHz** tags are either passive (no battery) or semi-passive (their battery is only used to improve their range when they respond to a reader), and should thus be fine on aircraft.
  - TRANSCOM seems to prefer 860-960 MHz for tracking cargo, but tools and OBLE are not cargo. Right?
  - Note: FasTrak uses 915 MHz RFID (see https://en.wikipedia.org/wiki/FasTrak#Operations_and_functionality).

- We're also looking at **2.56 GHz** (**Microwave**) RFID.
  - These are directional; a reader will get a much weaker reading if the tag is not oriented properly.
  - But, they work well when placed next to metallic objects.
    - *"Microwave antennas are directional, which helps define the IZ* for passive and semi-passive tags. Due to their shorter wavelength, they are easier to design to work with metallic objects. A wider band of frequencies is available to use and more hop channels are available. However, many commonly used devices such as cordless phones and microwave ovens use this frequency. Therefore, interference at microwave frequencies is possible. Government regulations regarding use of microwave frequencies for RFID are almost nonexistent. The semi-passive microwave RFID tags are used in long-range access control for vehicles, fleet identification, and highway toll collection. Active microwave tags are used for real time location systems (RTLS)."**

* IZ = "interrogation zone" - no kidding (!)

** Source: https://rfid4u.com/rfid-frequency/.

Overall Summary

TelemeTrak, Inc. - Tagging, tracking and locating (TTL) of Unpowered USAF Assets

Technical Abstract: TelemeTrak offers a real-time tagging, tracking and locating (TTL) system that will revolutionize how the AF tracks its equipment, spare parts and other unpowered assets, worldwide. TelemeTrak's system uses proprietary tech to operate tracking devices and report key data from up to 128 sensors every second. It can detect and report RFID tags on individual items. By automating much of inventory management, we can cut costs and free AF personnel for other tasks.

Technical Merit: TelemeTrak's product is already performing well in commercial (non-government) service. We have one patent issued, another allowed and third pending.

Team: Our team has seven engineers and well over a century's combined experience building high tech solutions and reaching commercial success. TelemeTrak is a **Certified HUBZone** company.

Commercialization: Two civilian companies are using our tracking solutions, and both SOCOM and Maersk (the world's largest ocean carrier) want to test.
The total addressable commercial market exceeds $19 Billion.

AF Contract: TelemeTrak has completed a contract (see next slide) to assess the suitability of its solutions for the AF. We plan to submit a SBIR 21.1 Phase II proposal in October 2021.

AF Contract

SOLICITATION/CONTRACT/ORDER FOR COMMERCIAL ITEMS
OFFEROR TO COMPLETE BLOCKS 12, 17, 23, 24, & 30

1. REQUISITION NUMBER	PAGE 1 OF
F4FBEQ1077A0FN	39

2. CONTRACT NO.	3. AWARD/EFFECTIVE DATE	4. ORDER NUMBER	5. SOLICITATION NUMBER	6. SOLICITATION ISSUE DATE
FA864921P1093	4/15/2021			

7. FOR SOLICITATION INFORMATION CALL: a. NAME: Tiffany Hoover, Contracting Officer; b. TELEPHONE NUMBER (No collect calls): 523-9656; 8. OFFER DUE DATE/ LOCAL TIME

9. ISSUED BY: CODE FA8649
FA8649 USAF RESEARCH LAB AFRL/SBRK
OF SET SOA 9700
2275 D STREET
WRIGHT PATTERSON AFB, OH 45433
United States
Tiffany Hoover, Contracting Officer
Michael Muskopf, Contract Specialist

10. THIS ACQUISITION IS: ☐ UNRESTRICTED OR ☒ SET ASIDE: 100 % FOR:
☒ SMALL BUSINESS
☐ HUBZONE SMALL BUSINESS
☐ SERVICE-DISABLED VETERAN-OWNED SMALL BUSINESS
☐ WOMEN-OWNED SMALL BUSINESS (WOSB) ELIGIBLE UNDER THE WOMEN-OWNED SMALL BUSINESS PROGRAM
☐ EDWOSB
☐ 8 (A)
NAICS: 541715
SIZE STANDARD: 500

11. DELIVERY FOR FOB DESTINATION UNLESS BLOCK IS MARKED: ☐ SEE SCHEDULE
12. DISCOUNT TERMS: Net Days 30
13a. ☐ THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)
13b. RATING
14. METHOD OF SOLICITATION: ☐ RFQ ☐ IFB ☐ RFP

15. DELIVER TO: CODE
SEE SCHEDULE

16. ADMINISTERED BY: CODE FA8649
[redacted]

17a. CONTRACTOR/ OFFEROR: CODE 8KD52 FACILITY CODE
TELEMETRAK,INC.
8000 EDGEWATER PTE 200
OAKLAND, CA 94621-2042
USA
Bjorn-Erik Eklund, Primary POC, Telephone: 4168369496 Email: erik@telemetrak.com
TELEPHONE NO.

17b. ☐ CHECK IF REMITTANCE IS DIFFERENT AND PUT SUCH ADDRESS IN OFFER

18a. PAYMENT WILL BE MADE BY: CODE F03000
ACCTG DIDB STA NR 503000
DFAS CO JAIM ANALYSIS RECON
3990 E BROAD ST BLDG 21 RM 6C 240
COLUMBUS, OH 43213-1152
United States

18b. SUBMIT INVOICES TO ADDRESS SHOWN IN BLOCK 18a UNLESS BLOCK BELOW IS CHECKED ☐ SEE ADDENDUM

19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES	21. QUANTITY	22. UNIT	23. UNIT PRICE	24. AMOUNT
	See Schedule				

(Use Reverse and/or Attach Additional Sheets as Necessary)

25. ACCOUNTING AND APPROPRIATION DATA: See Section G
26. TOTAL AWARD AMOUNT *(For Govt. Use Only)*: $49,995.00

☐ 27a. SOLICITATION INCORPORATES BY REFERENCE FAR 52.212-1, 52.212-4. FAR 52.212-3 AND 52.212-5 ARE ATTACHED. ADDENDA ☐ ARE ☐ ARE NOT ATTACHED
☐ 27b. CONTRACT/PURCHASE ORDER INCORPORATES BY REFERENCE FAR 52.212-4. FAR 52.212-5 IS ATTACHED. ADDENDA ☐ ARE ☐ ARE NOT ATTACHED

☐ 28. CONTRACTOR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN COPIES TO ISSUING OFFICE. CONTRACTOR AGREES TO FURNISH AND DELIVER ALL ITEMS SET FORTH OR OTHERWISE IDENTIFIED ABOVE AND ON ANY ADDITIONAL SHEETS SUBJECT TO THE TERMS AND CONDITIONS SPECIFIED

☒ 29. AWARD OF CONTRACT: REF. ____ OFFER DATED ____ YOUR OFFER ON SOLICITATION (BLOCK 5), INCLUDING ANY ADDITIONS OR CHANGES WHICH ARE SET FORTH HEREIN, IS ACCEPTED AS TO ITEMS: SEE SCHEDU

30a. SIGNATURE OF OFFEROR/CONTRACTOR	31a. UNITED STATES OF AMERICA *(SIGNATURE OF CONTRACTING OFFICER)*
[redacted]	[redacted]
30b. NAME AND TITLE OF SIGNER *(Type or print)*	30c. DATE SIGNED
31b. NAME OF CONTRACTING OFFICER *(Type or print)*	31c. DATE SIGNED
Tiffany Hoover	4/15/2021

AUTHORIZED FOR LOCAL REPRODUCTION
PREVIOUS EDITION IS NOT USABLE

STANDARD FORM 1449 (REV. 2/2012)
Prescribed by GSA - FAR (48 CFR) 53.212

Patent Protection*

(12) **United States Patent**
Ziegler

(10) **Patent No.: US 10,878,305 B1**
(45) **Date of Patent: Dec. 29, 2020**

(54) **SYSTEM FOR THE IDENTIFICATION OF A TRACTOR PLATFORM COUPLED TO A TOWED TRANSPORT PLATFORM**

(71) Applicant: **TelemeTrak, Inc.**, Oakland, CA (US)

(72) Inventor: **Frederick Steinway Ziegler**, San Francisco, CA (US)

(73) Assignee: **TELEMETRAK, INC.**, Oakland, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/132,448**

(22) Filed: **Sep. 16, 2018**

(51) **Int. Cl.**

G08B 13/14	(2006.01)
G06K 19/077	(2006.01)
B60D 1/24	(2006.01)
B60D 1/58	(2006.01)
G01S 19/14	(2010.01)
H04W 84/12	(2009.01)
G06K 7/10	(2006.01)
H04W 84/04	(2009.01)
H04W 84/06	(2009.01)
G01S 19/33	(2010.01)

(52) **U.S. Cl.**
CPC ***G06K 19/07766*** (2013.01); ***B60D 1/24*** (2013.01); ***B60D 1/58*** (2013.01); ***G01S 19/14*** (2013.01); ***G01S 19/33*** (2013.01); ***G06K 7/10297*** (2013.01); ***H04W 84/042*** (2013.01); ***H04W 84/06*** (2013.01); ***H04W 84/12*** (2013.01)

(58) **Field of Classification Search**
CPC G06K 19/07766; G05D 2201/0216; G05D 1/0212; G05D 1/0242; G05D 1/0055; G06Q 10/0833; H04B 7/00
See application file for complete search history.

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2011/0281522	A1 *	11/2011	Suda	G06Q 10/0833 455/41.2
2018/0039266	A1 *	2/2018	Dotzler	B60D 1/26
2019/0064828	A1 *	2/2019	Meredith	B62D 61/08
2019/0064835	A1 *	2/2019	Hoofard	B60D 1/62

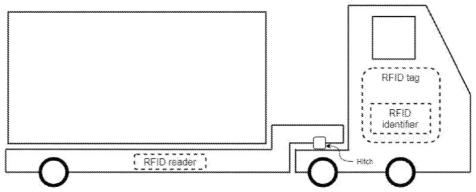
* cited by examiner

Primary Examiner — Toan N Pham

(57) **ABSTRACT**

Interested parties would like to know the identity of the semi-truck to which a semi-trailer is coupled. They would like to know when and where the semi-truck was coupled to and uncoupled from the semi-trailer. The embodiments all detect the semi-truck's identity. Some embodiments compute the identity of the semi-truck in environments where multiple semi-trucks are nearby. Some embodiments report the semi-truck's identity by wireless modem to said interested parties. Some embodiments detect and report the geolocation of the semi-trailer.

20 Claims, 2 Drawing Sheets



SOCOM Letter of Support

20 OCT 20

LETTER OF SUPPORT FOR CAPABILITIES DEVELOPMENT

FROM: Major Robert Billard, USMC

SUBJECT: Letter of Support for TelemeTrak Capabilities Development

1. I presently serve as Commanding Officer of the Logistics Company of the 1st Marine Raider Support Battalion, United States Marine Corps Special Operations Forces (MARSOC). I submit this letter in support of TelemeTrak's efforts to continue developing its logistics tracking and management capabilities.

2. Having spent a career spanning over 15 years in support of USMC operations worldwide, I see the value of TelemeTrak technology and applicability to the US military. With increasingly complex logistics challenges for global deployments, the ability to develop a technology that allows continuous and resilient tracking and contents management of iso containers will save money and time.

3. I strongly recommend the US military continue to explore the capabilities TelemeTrak could potentially offer units like MARSOC and other military logistics units to further test and evaluate this valuable resource.

4. This letter reflects my personal opinion based on extensive experience as a senior logistician.

R Billard

Major Robert Billard
Company Commander
Logistics Company
1st Marine Raider Support Battalion
Marine Raider Support Group
Marine Corps Special Operations Forces Command

This letter was prepared in a personal capacity. The opinions expressed in this letter are the author's own and may or may not reflect the views of the United States Navy, the Department of Defense and/or the United States government.

TelemeTrak, Inc. – CONFIDENTIAL for DoD

* TelemeTrak has one patent issued, one allowed, and one pending.

TelemeTrak

Spare slides

Erik Eklund, CEO erik@telemetrak.com +1-415-335-3436

RFID TAG CHARACTERISTICS OVERVIEW BASED ON FREQUENCY

Frequency Bands	Antenna	Data & Speed	Read Range	Usage
Low Frequency (LF) 125 kHz – 134 kHz	Induction Coil on Ferrite Core, or flat many turns	Low Read Speeds – Small Ammount of Data (16 bits)	Short to Medium 3-5 feel	– Access Control – Animal Tagging – Inventory Control – Car Immobilizer
High Frequency (HF) 13.56 MHz	Induction Coil flat 3-9 turns	Medium Read Speed Small to Medium amounts od Data	Short 1-3 feet	– Smart Cards – Item or Case level Tagging – Proximity Cards – Vicinity Cards
Very High Frequency (VHF) 433 Mhz – Active Tags	Internal Custom Design	High Read Speed Large Amount of Data	High 1-1000 feet	– Asset Tracking – Locationing – Container Tracking
Ultra High Frequency (UHF) 860 MHz – 960 MHz	Single or Double Dipole	High Read Speed Small to Medium amount of Data	Medium 1-30 feet	– Pallet or Case Level Tagging – DOD & Walmart Mandates
Microwave Frequency 2.45 GHz & 5.4 GHz	Single Dipole	High Read Speed Medium Amount of Data	High 1-300 feet	– Container Rail Car – Auto Toll Roads – Pallet Level Tracking

Source: https://rfid4u.com/rfid-frequency/.

RFID Detection Solutions: C-17 OBLE + Tools

	Portable		Fixed	
	Tracker Location	Power Source	Tracker Location	Power Source
 C-17	(1) In vehicle	(1) Vehicle power	(1) At cargo door	C-17 Power
	(2) Handheld	(2) Battery	(2) In middle of C-17	
 Tool Room	Handheld	Battery	(1) At entrance(s) (2) In middle of room	120V wall circuit

TelemeTrak

Tagging, Tracking and Locating (TTL) of Unpowered USAF Assets

Contract Number: FA864921P1093

CAGE Code: 8KD52

Erik Eklund, CEO erik@telemetrak.com +1-415-335-3436

TelemeTrak Tech Merit and Risk Summary

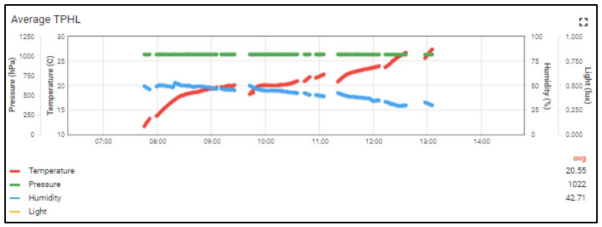
Technical Merit: TelemeTrak's product (see two photos and two user interface screen-shots, below) is now in service and performing well. We already have one patent issued, one allowed and a third pending. Two civilian companies are using our tracking solutions, and both SOCOM and Maersk (the world's largest ocean carrier) want to test them. We have one patent issued (see slide 4) another allowed, and a third pending, plus a SOCOM Letter of Support (slide 4).

Tracker (with external GPS and cellular antennas)

Tracker (in service)

UI – Live Map (location updates every second)

UI – Temperature, Pressure, Humidity (these can also update every second)



Technical Risk: We do not see any major technical risks remaining at this time. Well over 10 engineer-years of RDT&E have gone into our solution already. It works well and meets civilian needs nicely. We believe that only minimal modifications would be needed to meet USAF needs (as we currently understand them). While we may not yet be fully aware of all of these, we're confident that our team (with its extensive engineering, tracking, logistics and military experience) is up to the task.

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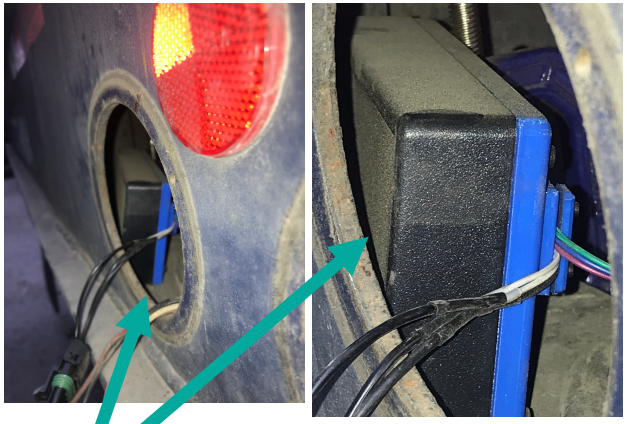
TelemeTrak Solution Set

Initial DoD Customer	Tracked Assets	Other DoD Customers	Civilian Customers	RFIDs	Location + Environment	Kinetic Energy Harvesting	Satellite comms needed*?
AF Maint Squadrons	Tools and OBLE	Other DoD maint orgs (a/c + vehs)	Airlines, Public transit, Railways, Trucking …	✅			
TRANSCOM	ISO Containers		Intermodal log cos, Walmart …		✅	✅ (basic)	
USMC	ISO Containers + RFID'd cargo	Army, Navy, SOCOM	Freight forwarders	✅	✅	✅ (basic)	
SOCOM	Friendly pers, enemy vehicles**	ARMY, USMC			✅	✅ (advanced)	✅

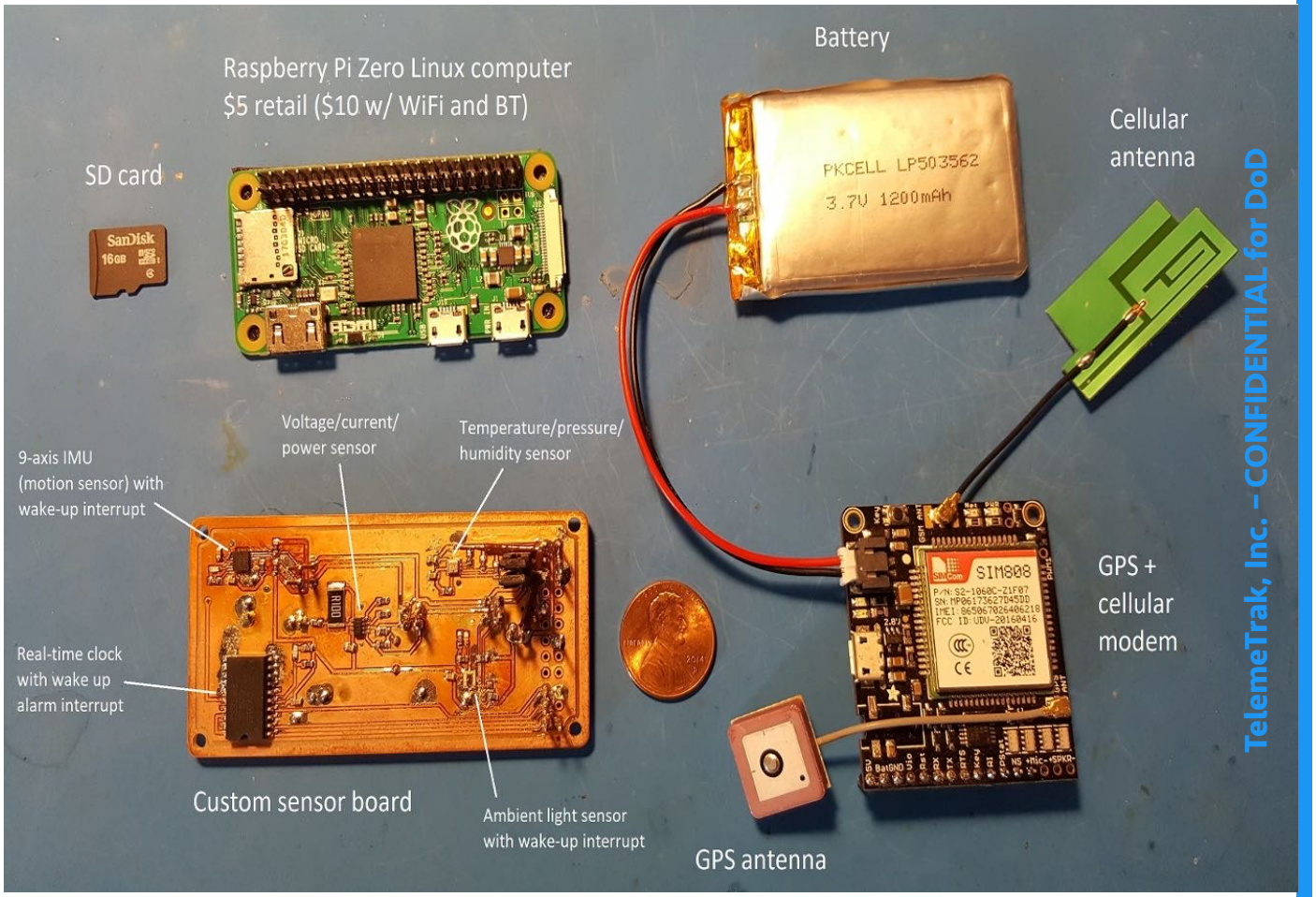
* In addition to cellular data and WiFi

** Covert tracking.

Product



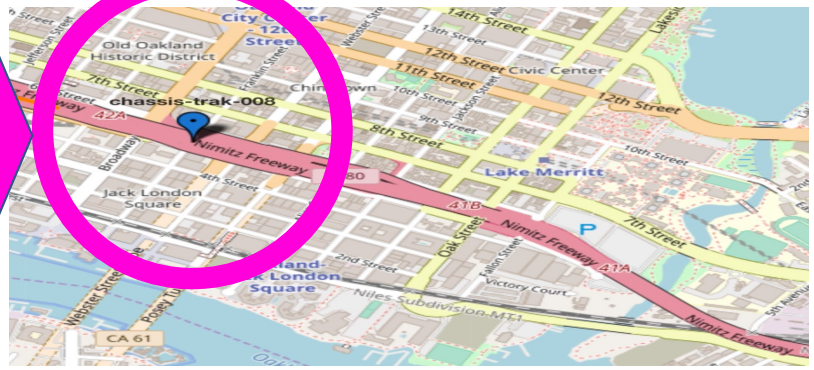
Tracker hidden inside trailer tail bar



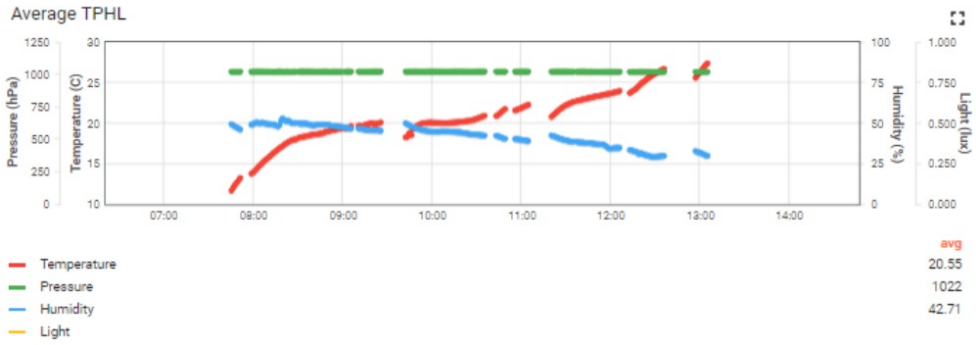
*Latest version not shown, in order to protect IP.

User Interface Examples

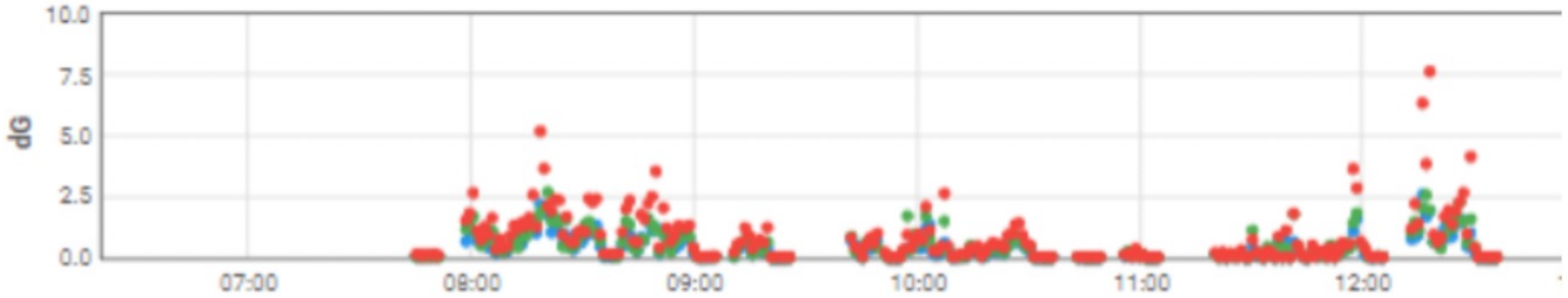
Location



Environmental Data



Accelerometer Data



TelemeTrak

$E_K = \frac{1}{2}mv^2$ → 🔋

Tracking Containers with Kinetic Energy*

Problem

DoD has 288,086 intermodal (ISO) containers, holding many $ Billions of materiel.

95% have no electric power.
→ Tracking is very manual, poor and unreliable, today.

Solution

Tracking system powers itself by harvesting kinetic energy*.
→ Makes battery changes / external power unnecessary.

Reports container location, temp and all cargo RFIDs inside.

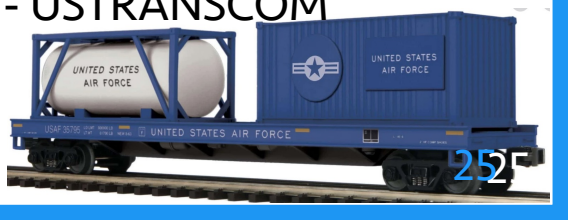
Impact

Automate container management to:

- cut costs
- free up personnel
- boost readiness and mission effectiveness**

TelemeTrak, Inc. – For DoD

"**DoD cannot effectively accomplish its mission without containers**...Inventory reporting needs to improve ... Readiness is the #1 purpose of DoD's containers" - USTRANSCOM



* Our trackers capture energy, from natural movement, a bit like self-winding watches do.

**Popular Mechanics: The Air Force's New Weapon Is...Shipping Containers?

- https://www.popularmechanicsa31263609/air-force-shipping-containers/

Questions for 437 Maintenance Group (1 of 2)

TSgt Valdez outlined two use cases, detecting RFID tagged items inside either:

1) **C-17s** (or other aircraft), or
2) **tool rooms** [or work centers, or trucks, etc).

Questions:

1. Did TelemeTrak understand the above correctly?
2. Location reporting is not needed. Right?
3. Our tracker can detect and report RFIDs continuously (send updates on changes - new ones that appear, ones that leave the premises) by WiFi, cellular data (or other networks, if needed). By automating stock-keeping of RFID tagged items, we can free up personnel for other tasks. TSgt Valdez thought that "real-time monitoring system sounds beneficial" but suggested checking with MSgt Riddell and Lt Boesiger. What do they think?
4. Is just one external reader desired?
5. Could there be an external and an internal reader?
6. Could the readers be mounted permanently, such as on the bottom side of a wing and/or in the cargo bay if small, economical, and with modest power consumption?
7. In the C-17 use case, is the need to detect loaded cargo, aircraft components, or both?

Questions for 437 Maintenance Group (2 of 2)

8. A possible issue is how TelemeTrak's reader manages responses from a large number of RFID tags
   What is the number of tags to be scanned? Dozens? Hundreds? Thousands?
9. One solution is to have the reader rotate in azimuth and scan the aircraft within a narrow angle from one end to the other. Another solution would be to do a narrow angle scan as the aircraft moves past the scanner. How do these sound?
10. Would it be acceptable to do one external scan and one internal scan if needed?
11. We could install our system on an aircraft and set it to automatically report on a regular basis, such as each time the engines are started. This would mean there is a record on a server of the inventory before each flight. Would that be useful?
12. If the use case, or a use case, is scanning cargo as it enters and leaves the aircraft, then readers around the door may be a good option. This could also detect what cargo is dropped in air drops. How often are those done with the C-17? Would reporting on those be useful, or is that already well tracked?
13. Could any of the components to scan have a power source?
14. Could any of the components to scan be networked, such as on a CAN bus?