ASPRS UAS Division

Unmanned Autonomous Systems
Dan Hubert

- Owner, MODUS AI
- 15 years experience in drone operations
- Program Manager, General Atomics MQ-9 Reaper
- Naval Aviator, retired
- TOP GUN Tactical Flight Instructor

www.modus-ai.com
American Society for Photogrammetry and Remote Sensing

- Founded in 1934
- Volunteer leadership
- US member organization of ISPRS (founded 1910)
- Encompasses many disciplines of the mapping sciences
- Collaboration of
  - academic sector (education and research)
  - government sector (policies, standards, and programs)
  - private sector (practitioners)
Technical Divisions

- Primary Data Acquisitions (sensors and platforms)
- Photogrammetric Applications (processes and methods)
- GIS (spatial analysis)
- Remote Sensing (image analysis)
- Lidar (Lidar analysis)
- UAS (Drone-based mapping practices)
- Professional Practice (standards, ethics, continuing education)
3 Pillars of UASD Mission

OUTREACH to expand UAS capabilities awareness and to grow and support the vision of ASPRS. We do this by engaging the ASPRS members and the mapping community on emerging UAS technology, techniques, education, standards, and professional opportunities.

EDUCATION to promote a tiered UAS mapping training program to promote successful UAS mapping operations and data delivery. Education programs should also assist professionals in preparing and obtaining their ASPRS certification and professional certification credits.

STANDARDS to advance industry standards on emerging UAS Mapping technology and related data accuracy.
Todays UAS Mapping Market
Education Opportunities

- High-Accuracy UAS Mapping Workshop
  - Commercial UAV EXPO (15 Sept 2020)
  - AVUSI Exponential (05 Oct 2020)

- Preparation for ASPRS Certification Course

- UAS Lidar for Precision Mapping

- UAS Photogrammetry Workshop (TBD 2021)

- UAS Lidar Workshop (TBD 2021)
Standards Initiative

Address the gap between traditional aerial mapping standards and the emerging small project UAS emerging workflow.
Get Involved

- Sign up for a region
- Take courses
- Get certified
- Become an instructor
- Sponsor research
- Take refresher courses

Regions:
- Alaska
- Central NY
- Cascadia
- Eastern Great Lakes
- Florida
- Heartland
- Intermountain
- Mid South
- New England
- North Atlantic
- Pacific SW
- Potomac
- Rocky Mountain
- Western Great Lakes
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**ASPRS offers 5 certification subject areas**

• Photogrammetry
• Remote Sensing
• GIS
• LiDAR
• UAS

**ASPRS offers 3 levels of certification**

• Professional / Scientist
  • 6 years of relevant experience
• Technologist
  • 3 years of relevant experience
• Intern
  • Relevant university level course work
  • Advisor recommendation
Get Involved

• Sign up for a region
• Take courses
• Get certified
• Become an instructors
• Sponsor research
• Take refresher courses
What is the Dronecode Project?

- Flight Control Software
- Communications Protocol
- Ground Control Station
- iOS/Android/Windows/Mac SDK
- Flight Controller Hardware Spec
Who is the Dronecode Project?

- **Governance**
  - Board of Directors selected from Sponsor companies and leadership

- **Project Code Managers**
  - Technical lead acting as the CTO for each sub-project

- **Core Contributors**
  - Developer community leaders responsible for most of the coding: ~7

- **Community Contributors**
  - 260+ individual software developers have contributed code to the project

- **Integration and Flight Test**
  - Flight Test team in Tijuana, MX performing simulation and real flight tests each day
Who sponsors the Dronecode Project?
Why is it Important?

- **Competition**
  - Community can band together and compete with State sponsored companies

- **Efficiency**
  - No duplication of effort on multiple flight control stacks
  - Convergence on Linux unshackled an era of application growth
  - FAA does not have to test and certify as many flight control systems

- **Excellence**
  - All of the big brains can work together and perfect the code and components
How can you benefit?

- **Standard Training and Operations**
  - All PX4 based UAS have common software update and install procedures

- **Interoperability**
  - User will not be locked into a single hardware vendor
  - User can switch to best hardware at any time

- **Extensibility**
  - User can extend the software or hire someone to do it for them
AUTOMATIC AERIAL INSPECTIONS

July 15, 2020
ESSENTIAL AERO

• Experts in Aviation, Mobile Comms, Edge Computing, Cloud Computing, Cyber-Security, and Data Analysis & Visualization

• Tactical Focus: Develop Airport Inspection Platform, Partnerships, build community of Early Adopter Customers

• Strategic Plan: Perfect automation platform, engage broader market

• Partners: 3DR, Auterion, Dronecode Project, InspiredFlight, Impossible Aerospace, FreeFly, FAA, Contra Costa CA, FAA COE TTHP, ESRI, Pix4D

Steve Boyle, CEO
steve@essentialaero.com
775-336-8045
Alliance for Certified Drone Manufacture in America (ACeDeMiA)

Arun Murthi
AERO&SPACE USA
Enabler of Emerged Opportunities

• CARES Act Direct Treasury Loan $7-$15 Mil Grant
• Drones vying for “Made in USA” Claim
• Government Owned Aircraft / Flight Services
  – “UAS Made in USA of USA Components”
• Drone Legislation
• National Security – “Open Source Manufacture”
• Strategic Competitors
• Executive Orders

Aligned with National Priorities
Matchmaker and Implementer

- Production Facility with SBA, FAA, DHS & NSA
- Developer with Production Holder
- User CONOP to Certificate Program and Certification Authority Officers
- Operator with Inspector and Air Traffic
- Special Compartmented Information Facility
- Implementer *
  - Low Rate Initial Production Facility Pathfinder

* US SBA Funded FAA Certified Production Facility
14 CFR Part 21 Certification Procedures

• Provide Open Source Approved Data
• Airworthiness Certificate
• Type Certificate, Including Amendment
• Supplemental Type Certificate
• Operator Licensing
• Design Approval Holder
• Production Approval Holder
• Parts Manufacturer Approval
• Operational Approval
• Cyber Security

National Airspace Access Use Cases
14 CFR Part 21 Certification Procedures

MODEL OF ORDER 8110.4 & 8120.22 TYPE AND PRODUCTION CERTIFICATION PROCESS

LOW RISK UAS PROJECT SPECIFIC

CONCEPTUAL DESIGN
- Conceptual Design
- Requirements Definition
- Company Data Generation
- Design Checklist
- PSCP Agreement
- FAA Project Work – ACO, MIDO, ARB, APS, P&I
- Final TCBM
- Final TCBM

COMPLIANCE PLANNING
- Compliance Planning
- Compliance Substantiation
- Compliance Data Generation
- Flight Test Data
- FAA Review of Compliance Data (not requiring F/T)
- Flight Test Data
- FAA Project Work – ACO, MIDO, ARB, APS, P&I
- Post Certification Activities
- Final TCBM
- Final TCBM

IMPLEMENTATION PHASE
- PSCP Agreement
- Conformity Test
- Approval Test Plan
- FAA Involvement
- Oversight and Delegation
- Engineering/Technical Plans
- FAA Project Work – ACO, MIDO, ARB, APS, P&I
- Final TCBM
- Final TCBM

CONOP
- Prolonged Activity
- Milestone
- Gate
- FAA Project Work – ACO, MIDO, ARB, APS, P&I
- Final TCBM
- Final TCBM

Operational and Maintenance Evaluations
- Flight Manual 2-6x
- Maintenance Manual 2-6x
- FAA Review of F/T Results
- FAA Project Work – MDC, ARB, APS, P&I
- Final TCBM
- Final TCBM

Applicant Engagement with Manufacturing Inspection District Office (MIDO) for PC Guidance
- Production Certification Process – Reference AC 21-43A, Order 8120.22A

Open Sourced Model
Eligibility

• Aircraft Platform Materials, including Plastics
• Flight Controllers, Propellers, Batteries
• Radios
• Data transmission devices
• Cameras and Radar, LIDAR
• Gimbals, Gyros, Accelerometers, Magnetometer/Compass (Inertial Measurement Unit)
• Servos and Motors (including Core Magnetics)
• Discrete, Solid State, Semiconductors and Processors
• Foundational (PCB, Connector, Wire Harness, Power)

“UAS Made in USA of USA Components”
Public Benefit

• **JOBS! JOBS! JOBS!**

• Private/Public Partnerships
  – Improved infrastructure
  – Safer, Secure performance

• Broader use by the Public and Government

• Enhancing opportunities in underserved communities

“In the Public Interest”
Bio

Arun K Murthy, arunmurthi9@gmail.com (714) 529-3855

8/17-8/20 FAA UAS Program Office. Supported LA ACO for 14 CFR Part 21.17(b) Type Certification of Low Risk UAS. Produced guidance material for applicant, and certification criteria for direct compliance findings by LA ACO:
- Lead Certification SME achieved acceptance of LA ACO’s Drone Code-3DR H-520G UAS Type and Production Certificate to Implementation Phase; Recommended approval of CONOP and produced PSCP with 14 CFR Part 21 (8110.4) Milestones and Deliverables. Witnessed D&R Certification Flight Testing and defined Software Conformity procedures. Assisted in Issue Papers establishing airworthiness requirements (G-1), means of compliance (G-2) and Product Conformity. Obtained sponsorship from FAA AJF Flight Programs and USAF HAFB for Airport, tech. ops. and flight inspection use cases for on-airport Part 91 Drone operations. Assisted AUS in applying system safety, integrity and development assurance principles to assure safety risk acceptance of UAS flight in the NAS-resulting in a new AUS Safety Risk Management (SRM) Order 8040.6.

AIDA CONTENT MANAGEMENT TECHNOLOGY & DRONE MEDIA ASSET MANAGEMENT PROGRAM
Summary and highlights of AIDA Content Management, Inc.:

- AIDACM formed in September 2017 AIDACM with partnership agreement* with Microstocksolutions
- Successfully developed and commercialized solutions that solve the key challenges that have existed with the content management industry’s well publicized metadata challenges with digital assets.
- The Solution Suite is now established within the content management industry with four product revenue channels with the SaaS Video Meta Hub (VMH), Enterprise workflow, Technology integration and AI/ML based products.
- Invigorating 12 Industries As To Innovative Metadata And Content Management
- Develop and expanding On-boarding platform
- Integration of AI/ML
- Partnership with 2XB Media
VMH SOLUTION SUITE WITH IFTBD

➢ The VMH Solution Suite consists of four individual solutions/offerings:
  ➢ Video Meta Hub (SaaS Cloud Solution) with integration of AI/ML
  ➢ Video Meta Hub Mobile Connect Application for metatagging on location within the Video Meta Hub (Android)
  ➢ Enterprise Workflow/Process Services (Managed Projects: Archives and Large volume processing/ingestion)
  ➢ Technical Integrations into other workflows

VRmeta produces a single source of ground truth for any asset it touches
precisely return exactly what anybody might be looking for is the holy grail of search and discovery

VMH: INVIGORATING INDUSTRIES AS TO METADATA AND CONTENT MANAGEMENT

- DAM/MAM
- GLAM SEGMENT
- Broadcasting
- Video-Journalism
- Healthcare
- Immersive/360 Content
- Marketing
- Ecommerce
- Filmmaking
- Stock Footage
- Drone Video
- Forensic Research

On-Boarding Support includes up to two hours of industry specific instruction on its application and use.
VMH Solution Technology:

- A revolutionary, ultra-precise targeting tool allowing users to input time-based descriptive metadata to any person, object or event, and record that meta-tag as either an in-frame metric or one based upon the asset time code.
- Or in short: **In frame Time Based Descriptive Metadata (IFTBD).**
- Technical Capabilities: Unlimited descriptive metadata, Tag orientation in frame, In and out times and duration of tag and Multiple data outputted formats (CSV, Embed XMP, XMP sidecar).

The VMH Solution Suite is for all metadata challenges in the content management and the content management industry spans all industries requiring the use and management of digital assets.

*First Touch Tool For Every Digital Asset*
VMH MAJOR FEATURES & FUNCTIONALITY

- Cloud Based & Secure
- **MAM Capability** – Adapt your storage needs to manage your digital assets. Quick search capability across all video assets within the VMH
- In-frame, **Time-Based Descriptive Metadata (IFTBD)** to enable a new level of control of your digital assets and leverage to increase their lifecycle value.
- **IPTC keyword, quick tags and caption metadata capability** for every popular video asset type
- Export and share both the videos and their corresponding metadata with every known DAM and MAM and postproduction workflow
- **Upload Video with .XMP Sidecar or with Embedded Metadata**
- **Auto-tagging UI** which allows for quick editing and enhancement of auto tags.
- **Transcription in the cloud** thus easy in frame time based meta tagging of any portion of the transcription.
- **Smooth Implementation/integration** with most media workflow
Public Service & Safety Organizations use of Media Asset Management and Metadata with Drone Operation digital asset output dramatically enhances their missions:

- Immediate Or Downstream Intelligence:
  - Surveillance And Monitoring Activity
  - Incident Scene Evidence
  - Forensic Legal Research

- After Action Reporting:
  - Evidence Protection
  - Disaster Survey and Assessment
  - Accident Reconstruction
  - Hazmat Calls
  - Improve Risk Reduction Assessments
  - Facilitate Training Development

The Video Meta Hub with the Unique Capability of In Frame Time Based Descriptive Metadata Application Enables this Broad Support for Public Service & Safety Organizations
DRONE OPERATIONS
MEDIA ASSET MANAGEMENT PROGRAM
SECURE THE VALUE OF DIGITAL ASSETS AND DATA
STATE OF DRONE INDUSTRY

- U.S. Commercial Drone industry is expanding
  - Number of Operators
  - Number of FAA licenses granted
  - Penetration of Industries

- What does this mean?:
  - Drone video data capture by itself will soon be commoditized:
    - Lowest cost focus
    - Operations moving in-house

- Drone Hardware Becoming More Affordable and Increasing Entrants. Result:
  - Proliferation Of Entrants Means Consolidation By The Most Efficient
  - Future Value Will Derive Through Differentiation of Incremental & Innovative Services
WHAT DOES THIS MEAN FOR DRONE INDUSTRY BUSINESS?

MAM/METADATA SUPPORTS THESE DRONE INDUSTRY VERTICALS:
- Agriculture
- Architecture and construction
- Emergency Services
- Engineering – Mining; Oil & Gas; Survey Engineering;
- Environmental Monitoring and Conservation
- Media/Film Production
- Training
- Telecommunication and Utilities

• Drone Services Need To Become More Innovative and Distinct To Create More Value For Clients
• Increased Drone Video/Data Value Enabled by Media Asset Management (MAM) and The Application Of Metadata To Industry Specific Output
• Media Asset Management:
  • Efficient Storage, Search, Retrieval of increasing volume of stored drone video and data
  • Rapid Availability and Discovery: make video assets more discoverable (internal to client’s organization) and to prospective external audiences (online)
  • Improved client deliverables
• Keys to Media Asset Management
  • Metadata Tagging
    • Applying Administrative, Technical and Descriptive keyword/tag/data descriptors to video digital assets/data enabling rapid search and retrieval for presentations, deliverables and reuse

SECURE THE VALUE OF DIGITAL ASSETS AND DATA
The **Video Meta Hub** is a cloud-based SAAS Solution to manage digital assets and data and apply metadata on a manual and auto tagged basis.

Meta-tags once applied are available for export in universal formats: Embedded XMP; CSV files; Data Sidecars for Editing Systems (Premiere, FCP).

Digital assets and data can be managed within **Video Meta Hub** for client deliverables.

- **IMPROVED DATA TO MEET DELIVERABLE REQUIREMENTS**
- **CLIENT ACCESSIBILITY TO DELIVERABLE**
- **IMPROVED PRESENTATION FOR DELIVERABLES AND SALES MATERIAL**
- **IMPROVED SEARCH AND RETRIEVAL OF DELIVERABLE**
- **BOTTOM LINE: IMPROVED COMPETITIVE ADVANTAGE**

**SECURE THE VALUE OF DIGITAL ASSETS AND DATA**
• **SMART MAM CAPABILITY:**
  - Multiple tagging methods on a near automated basis
  - Rapid Search, retrieval and discovery for internal and external accessibility and distribution
  - Managed storage for increased digital assets volume

• **Cloud-based and Secure**
  - Innovative In-frame, Time-Based Descriptive Metadata (IFTBD) to enable object and frame meta-tags for pinpoint retrieval
    - Quick Tags, IPTC keyword and caption metadata capability
  - **Auto-tagging UI** which allows for quick editing and enhancement of auto tags
  - Easily grab stills from video
  - Export and share both the videos and their corresponding metadata with postproduction workflows and most DAM/MAM solutions
  - **Upload Video with Existing Metadata**
  - Transcription of audio in the cloud thus easy in frame time based meta tagging of any portion of the transcription
  - **Companion mobile application for on location work**
  - Data integration with Google Earth for project-based presentation and pre-flight logistics

**SECURE THE VALUE OF DIGITAL ASSETS AND DATA**
• **Program Service Support:**
  - Media Asset Management, Metadata and Data Management Curriculum, Training, Workshops and Webinars.
  - Coordinates With Data Solutions Including Drone Mapping, Data Processing, GIS and Google Earth Project Creation
  - Supports Drone Data to Create Data Products and Services to Address a Variety Of Applications

• **Program Pricing Structure**
  - **30 Day Free Trial Period**
  - **Up To Two Hours Of Vertical Specific Onboarding Instruction**
  - **Three Tier Monthly Pricing (Annual Discounts Available):**
    - $29.95 with 250G Storage
    - $39.95 with 500G Storage
    - $59.95 with 1TB Storage
  - Additional Incremental Storage Available
  - Support Access

**SECURE THE VALUE OF DIGITAL ASSETS AND DATA**
DRONE OPERATIONS
MEDIA ASSET MANAGEMENT PROGRAM

SECURE THE VALUE OF DIGITAL ASSETS AND DATA

CONTACT INFORMATION:

peter.flood@aidacm.com
jenna.mulvey@aidacm.com

Visit AIDACM.COM and request demo or sign up for free trial with two hours of industry specific On-boarding instruction

SECURE THE REAL VALUE OF DIGITAL ASSETS AND DATA

The VRmeta VMH solution created by Mark Milstein, Managing Director of Microstocksolutions is licensed to AIDA Content Management For Sale, Platform Deployment, On Boarding and Adoption across industries

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Tommy Macias, Founder 2XB Media Productions
- Retired U.S. Air Force Intelligence officer
- Experience: Employment of UAVs (Predator) in military operations
- 2XB Media's focus: use of non-traditional media platforms to tell a story
- Drones, 360-degree imagery, Google Earth
- 2XB Books (enhanced eBooks) as a vehicle to package diverse media into one storytelling
DRONE OPERATIONS AND MEDIA ASSET MANAGEMENT

- 2XB Books: packages & integrates different forms of information
  - Unlocks the potential of digital media

- Caters to personal user preferences:
  - Videos
  - Text articles
  - Transcripts
  - checklists
WHAT IS METADATA AND METADATA TAGGING?

- Metadata is information that describes what is being viewed on screen
  - Typically a small number of words that describe an object or activity
  - Metadata can be used as a digital bookmark or “tag” that allows a specific video clip to be rapidly searched and found: Think Google or YouTube
  - Metadata “tagging” is using software to insert tags into video or photos
  - A user can label their own tags. A best practice is for the vernacular of the activity to provide the tags
    - Tags for a baseball game could include “balls, strikes, hit, out, pitcher, catcher, Seventh Inning Stretch”

Tagging is not a stand-alone activity, but part of a larger production process
AIDACM METADATA FOR DRONE OPERATIONS

- 2XB Book produced for AIDACM
- Training manual on how metadata tagging can be incorporated into the workflow of a drone operator
- Uses a construction site example
- Google Earth Pre-Survey
- View from a Drone
METADATA TAGGING PROCESS CHECKLIST

- Video capture
- File Rename
- **Preparation of Metadata tags**
- Video Upload
- **Metadata Tagging**
- Collect keywords (taxonomy)
- Video Download
Step 3: Identify Administrative Metadata Tags

- Data that identify unique information about a specific project
- Apply to every clip of drone video
Title Page

PROJECT OVERVIEW

CLIENT NAME
The Commercial Group

SURVEY DATE
Monday, May 11, 2020

PROJECT NUMBER
CG2020-002

SITE ARRIVAL TIME
10:00AM

PROJECT ADDRESS
60 E Padonia Rd
Lutherville-Timonium, MD 21093

SITE DEPARTURE TIME
11:15AM

WEATHER
Overcast, 60s

WORK LOG/TYPE OF SURVEY
Aerial Photography, Aerial Video, Mapping

PERSONNEL ON SITE
2 Pilots (License 98746)
1 Visual Observer, Assistant

SAFETY MEETING HELD ON SITE?
Yes

DESCRIPTION OF ACTIVITIES
The Global Air Media team conducted a standard drone survey for the ongoing construction site at 60 E. Padonia Rd Lutherville-Timonium. Upon arrival, GAM staff

Administrative Data
Administrative Data

Video Clip

Administrative Metadata Tag
Previously renamed tag

Descriptive Tag: Skid Steer Loader

Previously entered Administrative tag

Link to Clip
Take-Aways

• Metadata tagging is one part of a larger process that leads to discoverability

• Tagged video is more valuable than untagged — even if visual content is exactly the same

• Discoverability = Money
  • Saves time, saves on production, leads to a higher quality output
  • Upfront effort required, but benefits are long-term