# U.S. RPAS Aircrew Observations

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# Overview

- **RPAS Systems**
- **Anatomy of an RPAS**
- **Brief History of the MQ**
- **MQ-9A/9B differences**
- **Observations From an RPAS Aircrew Perspective**
- **U.S. RPAS Future**

# RPAS


Various U.S. and International RPAS
Source https://slate.com/business/2014/02/diagram-different-types-of-drones.html

# The Anatomy of an RPAS

LOS or
BLOS Link
Architecture

# A Brief History of the MQ

- General Atomics Aeronautical Systems, INC (GA-ASI) produced the Israeli-designed GNAT 750 in 1989
- To fulfill a U.S. advanced concept technology demonstration contract the GNAT 750 was reengineered into the RQ-1 Predator in 1994
- RQ-1 deployed to Hungary in support of Operation Allied Force from 1995-1998
- A review of RQ-1 performance in Operation Allied Force led to the arming of the platform with the first Hellfire missile shot on Feb 16, 2000 by Predator 3034
- RQ-1 Predator was redesignated MQ-1 Predator

GA-ASI GNAT 750
Source https://en.wikipedia.org/wiki/General_Atomics_Gnat

GA-ASI MQ-1 Predator
Source https://www.defensenews.com/air/2017/12/30/new-in-2018-air-force-will-officially-retire-mq-1-predator-drone/

# A Brief History of the MQ

- On Sep 12, 2001 the MQ-1 Predator inventory was sent to Afghanistan
- MQ-1 Predator quickly became synonymous with the GWOT and demand far outstripped supply
- MQ-1's ability to be a persistent Find, Fix, Finish (FFF) asset were invaluable to the ground force and quickly became their second favorite aircraft (because A-10, contractually is every grunt's favorite)
- The joint force came to crave more capability than MQ-1 could offer
- Air Force favored MQ-9A which had a first flight in 2001 and entered service in 2007
- Army developed MQ-1C which became a forward-deployed division-level asset and entered full-rate production in 2016

The sun rises on the USAF MQ-9A program
Source https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104470/mq-9-reaper/

# MQ-9A and MQ-9B Differences

MQ-9A
Source https://www.ga-asi.com/products-services

| Capability | MQ-9A | MQ-9B |
|---|---|---|
| Max Gross Takeoff Weight | **4763 kg** | **5670 kg** |
| Hardpoints | **7** | **9** |
| Internal Fuel Capacity | **1769 kg** | **2721 kg** |
| Payload (Internal/External) | **386/1361 kg** | **363/2155 kg** |
| Max Endurance | **25 Hours** | **40 Hours** |
| Ferry Range | **3400 nmi** | **6,000 nmi** |
| Detect and Avoid System | **ANG Pursuing** | **X** |
| Fully Certified Flight System | | **X** |
| HMI Improvements | | **X** |
| Automatic Takeoff and Land | **Partial** | **X** |
| STOL Kit Available | | **X** |

MQ-9B
Source https://www.ga-asi.com/products-services

MQ-9A Block 30 Ground Control Station
Source https://www.ga-asi.com/ground-control-stations/block-30

MQ-9B Certifiable Ground Control Station
Source https://www.ga-asi.com/ground-control-stations/certifiable-ground-control-station

Source https://www.ga-asi.com/products-services

# U.S. RPAS Observations Persistence is King

- Persistence is by far the most valuable trait of any RPAS system
  - Crew fatigue can be mitigated with crew swaps
  - Lack of life support, flight deck, and extra redundancy is eliminated allowing for more fuel and more aerodynamic designs
  - Tactical patience is afforded to the RPAS aircrew
  - Being on-station leads to much faster response times than on ground-alert
    - RPAS are almost always the first aircraft on station


Some RPAS may be slow, but most are persistent
Source https://thestrive.co/persistence-quotes/

# U.S. RPAS Observations
# True Multi Role Capabilities

- RPAS are powerful Intelligence, Surveillance, and Reconnaissance (ISR) platforms
- RPAS excel as precision strike platforms when weaponized
- RPAS can fill roles in almost every mission set
- RPAS can be scaled and customized for almost any conflict or mission

Artist rendering of MQ-9B SeaGuardian
Source https://www.ga-asi.com/remotely-piloted-aircraft/mq-9b-seaguardian

# U.S. RPAS Observations Acceptable Level of Risk

- RPAS operate in a different category of Acceptable Level of Risk (ALR) because…
  - There is no aircrew at risk
  - No international precedent for RPAS shoot-downs
  - RPAS are generally far less expensive than equivalent manned platforms
- RPAS cost, availability, and loss of capability are the driving considerations for ALR

MQ-4 Triton Broad Area Maritime Surveillance (BAMS) valued at $220 Million
Source https://www.northropgrumman.com/what-we-do/air/triton/

Turkish TB-2 Bayraktar valued at $5 Million
http://www.military-today.com/aircraft/bayraktar_tb2.htm

# U.S. RPAS Observations Command and Control (C2) Enabler

- The Predator video feed is a valuable tool to connect higher-echelon C2 with fight
- This has its benefits and drawbacks
  - Benefit – RPAS can drive the fight and boost whole-force Situational Awareness (SA)
  - Drawback – Pilot in Command replaced by Pilot by Committee

CENTCOM Air Operations Center Operations Floor
Source https://www.afcent.af.mil/About/Fact-Sheets/Display/Article/217803/combined-air-operations-center-caoc/

# U.S. RPAS Observations
# RPAS in Domestic Operations

- California Air National Guard has flown California Wildfire support missions for 8 years
  - 214 campers located at Shaver Lake by MQ-9A in Sep 2020. MQ-9A remained on station to keep HQ apprised of fires progress, coordinate infil/exfil of National Guard CH-47 and HH-60, and
- MQ-9A has responded to earthquakes, fires, floods, hurricanes, border patrol, lost hikers, and support to law enforcement

Picture from inside a CH-47 of rescued campers from Shaver Lake
Source https://www.military.com/daily-news/2020/09/10/inside-national-guards-daring-rescue-of-hundreds-california-wildfire.html

MQ-9A piloted by California ANG performs Incident Awareness and Assessment on a remote private property during a CA wildfire

# U.S. RPAS Observations
# RPAS are “Grey Zone” Champions

- Based on all of U.S. observations, no aircraft performs better for “Grey Zone” missions
- Weaponized RPAS can provide the entire kill-chain of effects
- Saturation of RPAS can desensitize an adversary
- RPAS presence can be demoralizing for an adversary and can be used to shape behavior

Picture of MQ-9A supporting VALIANT SHIELD ‘22 on Anderson AFB, Guam
Source https://www.pacaf.af.mil/News/Article-Display/Article/3115921/mq-9-showcases-capabilities-to-joint-force-during-first-time-valiant-shield-par/

# U.S. RPAS Observations Lack of Weather Hardiness

- MQ-9A was designed with desert operations in mind
- Icing, weather degradations to the Beyond Line of Sight (BLOS) link, hail, extreme heat, extreme cold, and high winds punish this aircraft
- Lost-link weather avoidance is also an extreme challenge, especially when transits can exceed 8 hours
  - Deploying a weather personnel to operations sites is key


Weather is a big limiting factor of MQ-9A
Source https://www.youtube.com/watch?v=GldZJvuFl44

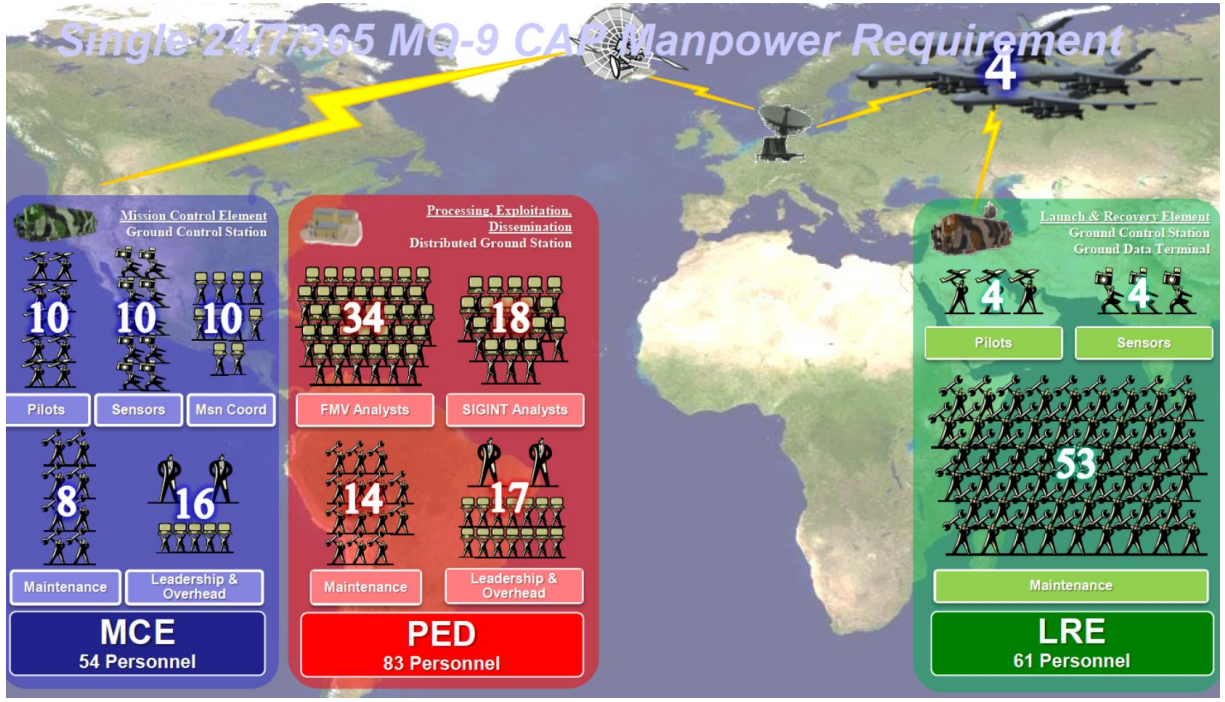
# U.S. RPAS Observations Training

- The U.S. has struggled to meet demand for RPAS aircrew since the RPAS was invented
- RPAS aircrew have been through many generations
  - First-generation RPAS aircrew experienced aircrew moved from fighter and heavy platforms to RPAS fill urgent need
  - Second-generation RPAS aircrew were Undergraduate Pilot Training pipeline redirects to RPAS with an option to stay or leave
  - Third-generation RPAS aircrew were put through the abbreviated RPAS-only Aircrew Pipeline that shaved out almost all Undergraduate Pilot Training elements
- Second and third generation RPAS aircrew struggle with basic airmanship
  - I am a perfect example, 2,500 flight hours (very few in FAA/ICAO airspace), 0 aircraft walkarounds, 0 aircraft taxis, 0 takeoffs, 0 landings
  - A lot has atrophied since my last landing in a T-1A in 2010!
- RPAS aircrew have been overseas in the fight, not on the range
- Opportunities for Augmented Reality/Virtual Reality, Flight Simulator, and Companion trainers abound


Air Force T-6A trainer that RPAS aircrew don't fly
Source
http://theroadtoafwings.blogspot.com/p/upt-phase-1-and-2.html

# U.S. RPAS Observations Exploitation Remains a Challenge

- The U.S. still struggles to exploit the vast amount of data that RPAS systems generate
- Processing, Exploitation, and Dissemination (PED) of RPAS intelligence has been the largest part of the manning bill for U.S. RPAS
- Minimizing PED has been a contentious topic in the U.S.
- I encourage Canada to be innovative in this space!

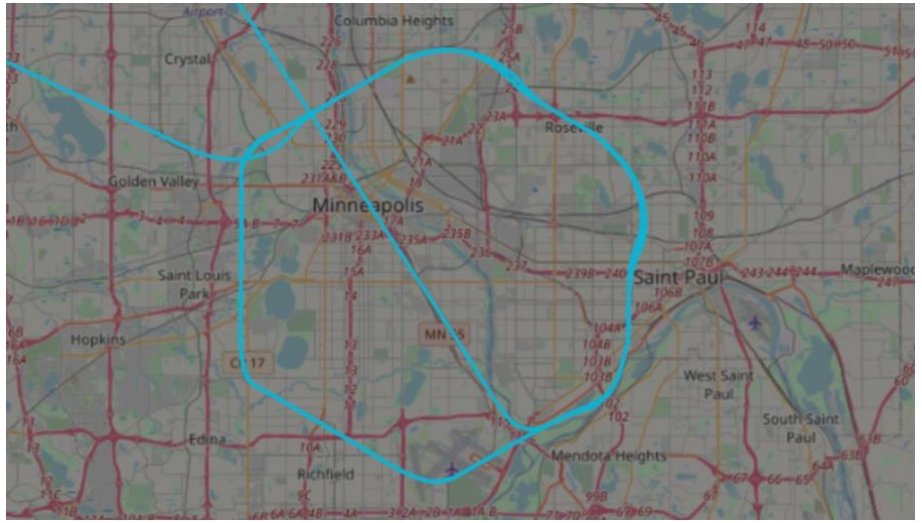


Legacy manpower footprint for 4 x MQ-9A 24/7/365 patrols

# U.S. RPAS Observations Domestic Unease with RPAS

- Protesting of weaponized RPAS bases in the U.S. is commonplace
- US Customs and Border Patrol faced Congressional backlash for using an MQ-9 on 29 May 2020 during the George Floyd protests in Minneapolis, MN
- Average US citizen is supportive of RPAS but uneasy about “spy drones” flying near their house
- DoD noise complaint lines are routinely called to report RPAS activity


Code Pink organizes protest at Creech AFB, NV
Source https://www.codepink.org/ground_the_drones




ADSB data of CBP MQ-9 orbiting Minneapolis, MN on 29 May 2020
Source https://www.cnn.com/2020/06/11/politics/spy-planes-george-floyd-protests/index.html

# U.S. RPAS Observations
# Lost Control of the RPAS Narrative

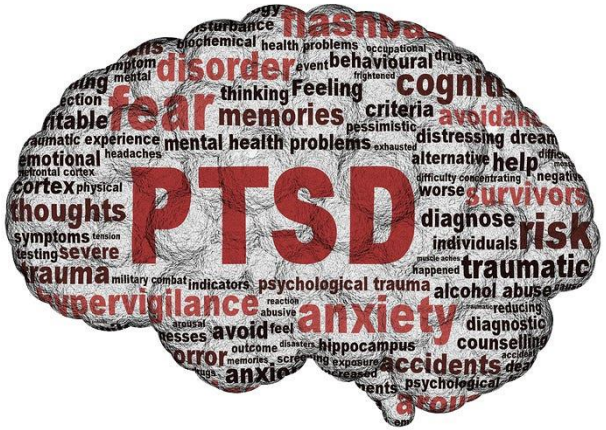
- U.S. Air Force has failed to curtail the following RPAS myths despite USAF Public Affairs attempts
  - RPAS = drone
  - RPAS = autonomous vehicle
  - Military RPAS spy on U.S. citizens
  - RPAS strike at random
  - RPAS are alien technology harvested from Area 51
  - RPAS are unmanned and require no manpower to operate
  - RPAS aircrew are gamers
  - All RPAS aircrew suffer from PTSD
  - RPAS aircrew are not compassionate or honorable
  - RPAS will replace manned aircraft


G.I. Joe Drone Operator skit on YouTube 2012
Source https://www.youtube.com/watch?v=Ohd2EjqUscQ

A poor depiction of MQ-9 aircrew from “Jack Ryan” Season 1 Episode 3 “BLACK 22”
Source https://www.geekgirlauthority.com/tom-clancys-jack-ryan-recap-s01e03-black-22/

# U.S. RPAS Observations
# Post Traumatic Stress and Mental Health

- USAF was not initially prepared for mental health challenges of remote warfare
- Transition to/from “normal life” to combat is stressful
  - No isolation from the regular stressors of home
  - No decompression built in from combat back to the normal world
- Studies determined a 4.3% rate of Post Traumatic Stress Disorder (PTSD) amongst RPAS aircrew. Averaged PTSD rates from battlefield personnel is between 4-18%
- USAF brought mental healthcare into the squadron and all RPAS aircrew have mental healthcare professionals with a matching security clearance to help manage stressors




PTSD is still a source of major concern for RPAS aircrew
Source
https://www.forbes.com/sites/toddessig/2015/12/02/post-traumatic-stress-disorder-ptsd-is-more-than-a-bad-story/?sh=7b4b8a86621d

# U.S. RPAS Observations
# Simulators and Training Remain a Challenge

- MQ-9A has had 5 variants of MQ-9 simulators
- None have been able to accurately train to all
  - Sensor optimization
  - Emergency procedures
- Until recently RPAS simulators were not accredited for virtual distributed training – this has been a game-changer

Simulators remain a challenge for RPAS aircrew
Source
https://www.asdnews.com/news/defense/2019/07/01/usaf-orders-more-mjat-mq9-reaper-simulators-with-metavr-image-generators

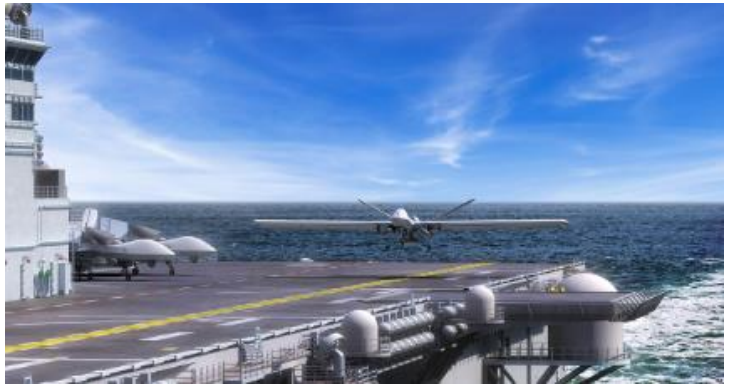
# U.S. RPAS Future

- The USAF is sitting at a crossroads presently
  - Does it go back to a mostly manned fleet
  - Does it double-down on multi-role RPAS
  - Does it move to more to full autonomous solutions


Boeing Advanced Teaming System
Source
https://www.forbes.com/sites/lorenthompson/2020/08/28/air-forces-skyborg-robotic-wingman-will-revolutionize-how-air-warfare-is-waged-and-how-weapons-are-bought/?sh=6b40375f6e76

- Frankly, we don't yet know what the future holds

Bayraktar success in Ukraine against Russia has given some officials pause to abandon RPAS
http://www.military-today.com/aircraft/bayraktar_tb2.htm



GA-ASI MQ-9B STOL Concept
Source https://www.ga-asi.com/remotely-piloted-aircraft/mq-9b-skyguardian

# Conclusion

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# Questions