U.S. Department of Homeland Security

SAVER System Assessment and Validation for Emergency Responders ®

Science and Technology

Blue UAS for First Responders in Rural Environments Assessment QuickLook

NUSTL NATIONAL URBAN SECURITY TECHNOLOGY LABORATORY

BLUE UNMANNED AIRCRAFT SYSTEMS FOR FIRST RESPONDERS

Over the past decade, first responders have begun integrating small, unmanned aircraft systems (UAS) as a resource for a variety of operational needs. UAS provide first responders with an aerial view of their environment and can be outfitted with various sensors tailored to address different applications. Unmanned aircraft systems. UAS, often referred to as "drones," are used by first responders in support of public safety activities such as search and rescue, firefighting, and post-incident reconstruction. "Blue" UAS refers to those systems validated by the Department of Defense (DoD), and which appear on their "Blue List" as cyber-secure, safe to fly, and compliant with current laws pertaining to government entities' technology procurements." This equipment falls under the AEL reference number 03OE-07-SUAS titled "System, Small Unmanned Aircraft."

Assessment Overview

In June 2024, the National Urban Security Technology Laboratory's (NUSTL) System Assessment and Validation for Emergency Responders (SAVER®) program, with the support of DAGER Technology, conducted an assessment of Blue unmanned aircraft systems (or "Blue UAS") for use in rural environments. Blue UAS are systems that have undergone cybersecurity testing by the DoD's Defense Innovation Unit (DIU) and are compliant with Section 848 of the National Defense Authorization Act (NDAA) for Fiscal Year 2020, which prohibits the use of UAS or related services or equipment from certain foreign entities. The assessment was held at Texas A&M University's Engineering Extension Service (TEEX) in College Station, Texas, featuring austere areas with various natural terrains and man-made structures. Assessment activities and evaluation criteria were based on recommendations from a focus group of responders with UAS expertise. Focus group participants also assigned a weight from 1 to 5 for the importance of each criterion. A report on that focus group can be found on the SAVER website.

Figure 1. An evaluator preparing the Skydio X2D UAS for launch

Figure 2. Ascent AeroSystems Spirit UAS launching in low-light conditions

Nine emergency responders, each subject matter experts (SMEs) on UAS for response, from Colorado, Florida, Michigan, New York, Oklahoma, Oregon, Texas, and Virginia assessed four platforms' performance in simulated operational scenarios in full, low, and no-light conditions. This included preparing drones for deployment, flying them to gather information, changing batteries and redeploying, and conducting maintenance that responders would perform with routine use. Throughout these activities the SMEs assessed 13 evaluation criteria addressed four SAVER categories: capability, deployability, usability and maintainability: camera visual acuity, command and control link quality, covertness, customizable safety features, ease of use, flight duration, ground control station interface (GCS), GCS legibility, in-house maintenance, latency, portability, time to deploy, and time to redeploy. SMEs scored the criteria separately during day and night operations and found key differences that are explored in this report.

Assessed Products

Ascent AeroSystems
Spirit
GSA Pricing: $56,195

Parrot Drones
ANAFI USA GOV
GSA Pricing: $13,964

Skydio
X2D
GSA Pricing: $21,889

Teal Drones
Teal 2
GSA Pricing: $15,073

Prices shown are rounded to the nearest whole dollar.

Image Credits: Ascent AeroSystems, Parrot Drones, Skydio, and Teal Drones

Overall Results

The Parrot ANAFI USA GOV and Ascent AeroSystems Spirit both received a 3.3, the highest score for daytime operations. For nighttime operations, the Teal 2 and Ascent AeroSystems Spirit tied with the highest score of 3.2. In the tables below, UAS are listed from highest to lowest overall score. Each criterion was scored on a scale from 1 to 5 (meeting none of their expectations to exceeding their expectations). The category scores are determined by calculating the average of the evaluation criteria scores. Evaluators also assessed in-house maintenance, which was scored independently from day and night operations and does not appear in the tables below. For this criterion, evaluators performed inspections and component replacements for each platform. The Teal 2 received the highest score of 3.7, which the SMEs attributed to the ease of replacing propellers and UAS capability for firmware updates. The ANAFI UAS GOV scored a 2.8 and the Skydio X2D, a 2.7. The Spirit received the lowest score of 2.4; evaluators cited the cost of replacement propellers as well as insufficient directional marking on the blades that could result in their being mounted backwards.

Day Operations

Company	Model	Overall Score	Capability	Usability	Deployability
Parrot Drones	ANAFI USA GOV	3.3	2.9	3.1	4.2
Ascent AeroSystems	Spirit	3.3	3.3	3.5	3.0
Skydio	X2D	3.1	3.1	2.8	3.3
Teal Drones	Teal 2	2.8	2.6	2.9	3.0

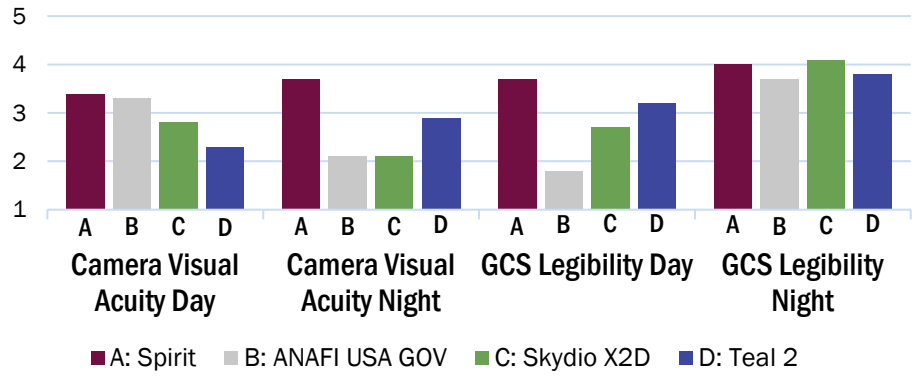
Night Operations

Company	Model	Overall Score	Capability	Usability	Deployability
Teal Drones	Teal 2	3.2	3.2	3.2	3.5
Ascent AeroSystems	Spirit	3.2	3.3	3.1	3.1
Skydio	X2D	3.1	3.0	3.1	3.4
Parrot Drones	ANAFI USA GOV	2.9	2.5	3.1	3.8

Key Takeaways

Scores for select criteria are displayed in Charts 1 and 2. These criteria highlight key findings between the UAS where evaluators found more pronounced differences between the platforms, including use across day and night use.

Chart 1: Select Acuity & Legibility Criteria Comparison



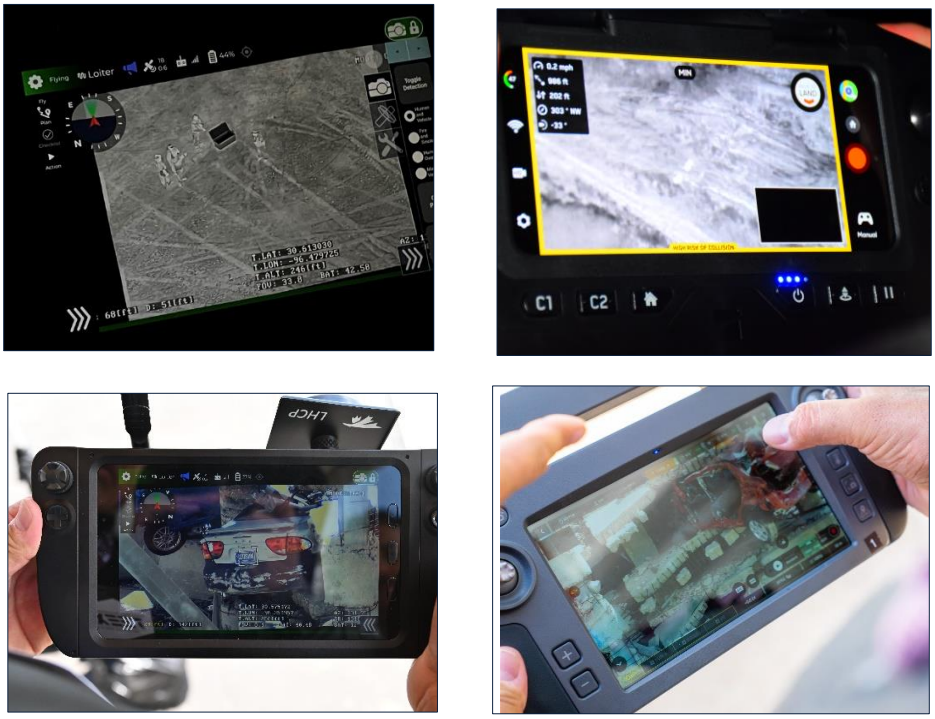


Figure 3. Camera images and GCS displays for the Spirit (upper left) and Skydio X2D (upper right) during night operations, as well as for the Spirit (lower left) and ANAFI USA GOV (lower right) during day operations.

Chart 1 Criteria: Camera Acuity & GCS Legibility

Camera visual acuity was of utmost importance due to the standoff nature of emergency response operations via drone. Evaluators scored the Spirit, outfitted with the NightHawk2-HZ electro-optical/infra-red (EO/IR), the highest for camera visual acuity in both day and night operations. They found its imagery to be clear and noted it retained resolution when zoomed in. Evaluators also appreciated the level of detail displayed when using thermal imaging. For day operations, the Teal 2 the lowest due to issues with pixelation and over exposure, as well as its inability to zoom on EO. For night operations, the Parrot and Skydio X2D scored the lowest, citing blurry, pixelated imagery and artifacts from the digital zoom.

The Skydio X2D scored the highest for its GCS legibility at night. Nonetheless, the SMEs found the Spirit GCS most consistently legible across day and night operations. The Spirit's GCS screen impressed during day operations with its performance in direct sunlight and the effectiveness of its embedded brightness adjustment sensor. SMEs noted that adjustments to the GCS were not needed at night. The Parrot received the lowest score for GCS legibility during daytime as SMEs experienced visibility issues like shadowing, glare, and brightness. The adaptive brightness sensor was covered by the controller hardware; therefore, users must exit the Anafi software to adjust brightness in the tablet settings.

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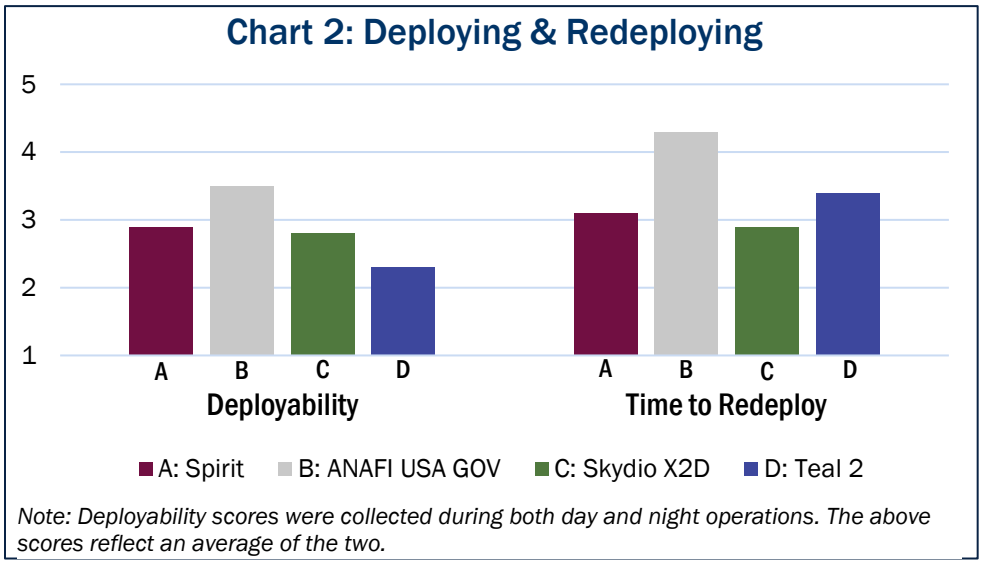

Note: Deployability scores were collected during both day and night operations. The above scores reflect an average of the two.

Figure 4. Evaluators preparing the Parrot ANAFI USA GOV (left) and Teal 2 (right) for deployment

For More Information

This document provides limited information on SAVER's Blue UAS for First Responders in Rural Environments assessment including highlights and comparative analysis. Additional information on the assessment and the complete comparative results will be provided in a full report to be published on the SAVER website, specifically the "Blue UAS for First Responders" page found at www.dhs.gov/science-and-technology/saver/blue-uas-first-responders.

Chart 2 Criteria: Deploying & Redeploying

Evaluators deemed time to deploy and redeploy as important operational factors. The Parrot ANAFI USA GOV scored the highest in both criteria.

Evaluators found the ANAFI USA GOV easy to transport, configure, and launch. However, they expressed concern over the fragility of the battery connectors, which exhibited stress fractures after their limited use at the assessment. Evaluators gave their lowest score deployability to the Teal 2 as they experienced difficulties establishing a connection between the aircraft and GCS, which resulted in delayed launches (up to 15 minutes). However, they appreciated that both the Teal 2 GCS and drone used the same battery.

Evaluators were satisfied with the procedure for replacing the battery and the amount of time it took to redeploy the Parrot ANAFI UAS GOV. For redeployment, the Skydio X2D scored the lowest due to the time it took SMES to calibrate the system and relaunch following a battery change.

More than 1,100 publications can be found on the SAVER Website at www.dhs.gov/science-and-technology/saver. For more information on the National Urban Security Technology Laboratory please visit our website or contact us at NUSTL@hq.dhs.gov.

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