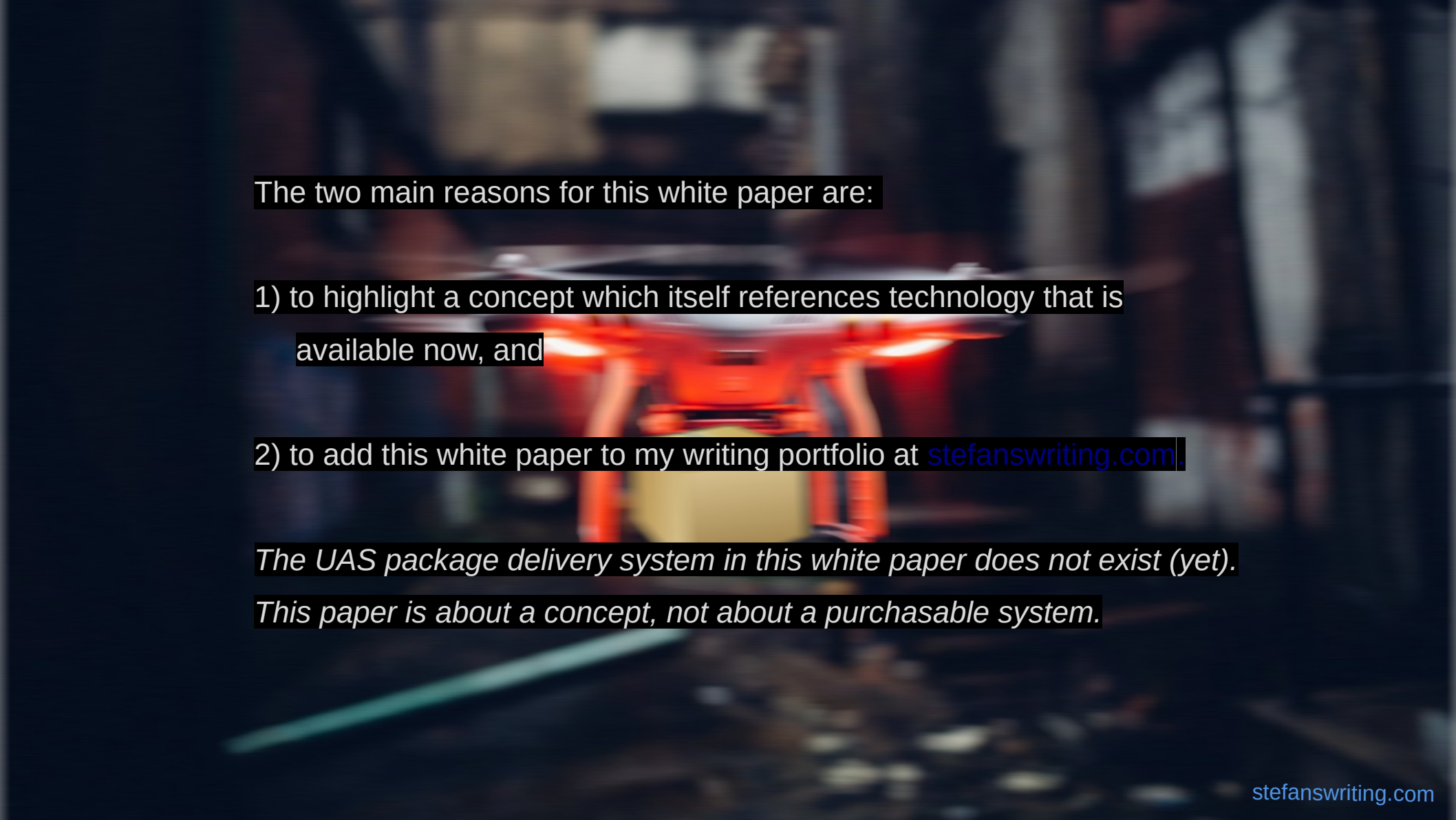

The two main reasons for this white paper are:

1) to highlight a concept which itself references technology that is available now, and

2) to add this white paper to my writing portfolio at stefanswriting.com.

The UAS package delivery system in this white paper does not exist (yet). This paper is about a concept, not about a purchasable system.

Current State of Package Delivery

Modern package delivery generally runs from 7:00am to 10:00pm, leaving 9 hours per day that are not utilized.

9 hours per day * 365 days per year is 3,285 delivery hours (the equivalent of 19.5 weeks at 24 hours a day); this number is a minimum because it does not account for holidays when entire 24-hour blocks of time, or more, are not utilized. This is untenable.

Enter the 24-hour, autonomous drone based package delivery service

Today, we live in a 24-hour society, and there are many customers who would rather receive a delivery at 3:00am than have their package essentially handed to a porch pirate in the middle of the day; this could be because the customer is not available at the delivery location during standard delivery times, or they are busy doing something else.

By utilizing missile target homing technology, autonomous unmanned aerial system (UAS) can make package deliveries 24 hours a day, even where a GPS signal may be lost, spoofed[1],or otherwise contested[2].

Missile Guidance Tech in Brief

Missiles find and home in on targets using a mixture of technologies: radar, inertial guidance systems, terrain contour matching, and an optical matching system - which can be paired with thermal imaging to work in day/night and fog conditions.

Inertial Guidance Systems

Inertial guidance systems utilize as inputs: original known position, gyroscopic directional input, and accelerometer speed input[3]. Utilizing algorithms to process the inputs, the system can tell where it is in three-dimensional space without any external signals.

These systems' accuracy is inversely proportional to the time in use without being re-calibrated, so they are best used in conjunction with another navigational device.

Radar

Radar emits energy in the form of radio waves, just as a flashlight emits energy in the form of visible light[4]. The visible light is reflected back at our eyes and our brain forms an image. Radio waves are reflected back at the radar antenna, and the computer forms an image.

The image can be dots on a radar screen or even maps of entire areas that look similar to a large area photograph[5]. These radar maps show the differences in the height of objects in the radar scan's area of interest at high resolution.

TERCOM

Terrain contour matching (TERCOM)[7] starts with the map that has been created by radar scanning an area, often from a satellite, and noting the altitude of the objects in the scanned area of interest. When all these altitudes are put together it forms a type of map i.e., an SAR (Single Aperture Radar)[4] urban terrain map[5].

With this map, a missile can have an internal radar turned on and scanning and an onboard computer constantly comparing its radar readings with that of the onboard map to know where it is. The computer then sends commands to manipulate the flight surfaces for any corrective maneuvering that is needed[6].

Optical

Utilizing modern solid-state cameras combined with a computer using digital scene matching area correlation (DSMAC)[7], a missile which is close to its target can compare the optical images that it sees at its location with a stored map that includes its intended target.

In the final stages of a missile’s life, it compares the target it sees at the set location with the target picture in the onboard map, makes a match, and homes in on its target.

Thermal Imaging

Thermal imaging technology uses the natural heat present in any given environment to produce a visual representation of that environment[8].

Advanced night vision equipment utilizes this technology and, unlike standard night vision equipment, requires neither ambient light nor an illuminator to aid in producing its images.

A Tenable Future

Using the above-mentioned technologies, an unmanned aerial system (UAS) can deliver a package 24 hours a day, 365 days a year, without the need for GPS signals. The same technology is used currently to deliver a warhead to a target quickly, the proposal is to instead use it to deliver a package relatively slowly.

Opening the delivery time options to this extent will allow the full utilization of the 3,285 (+) delivery hours that are currently not utilized for deliveries.

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