UNITED STATES
AIR FORCE
ACADEMY

SUP SAT

United States Air Force Academy
Junhyung Park

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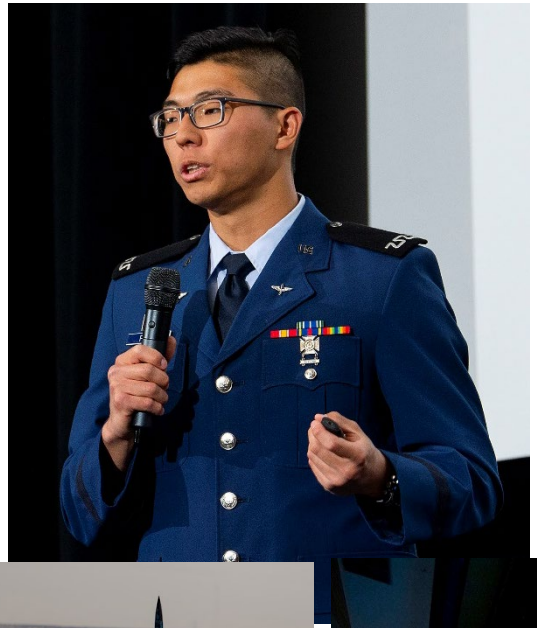
Junhyung Park
BS: Electrical and Computer Engineering
Minor: Spanish



- Electronics Team Lead for Blue Horizon Rocketry Club
- Software Engineer for Weather Balloon Research
- FalconTank Contestant/SPARK
- D-III Men's Ultimate Frisbee

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Team Members

- Junhyung Park - ECE
- Simon Gott - ECE
- Gunnar Gott - ECE
- Shepherd Kruse - Astronautical Engineering
- Jack Arne - Aeronautical Engineering
- Matthew Sharkey - Aeronautical Engineering
- Ethan Lefebvre - Computer Science

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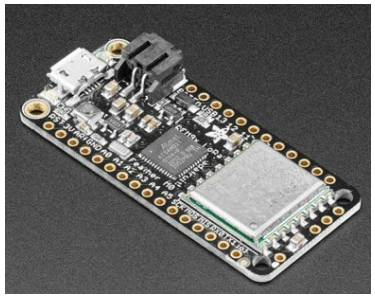
Goals

- Spirit Mission: A tradition that the first-year cadets do a special activity to raise the morale of the students through tough, grueling academic and military life.
  - Send three-star general's flight cap to near-space!

- Research
  - Long Range Wide Area Network (LoRaWAN) Radio Transmission System
  - Cheaper weather balloon research!



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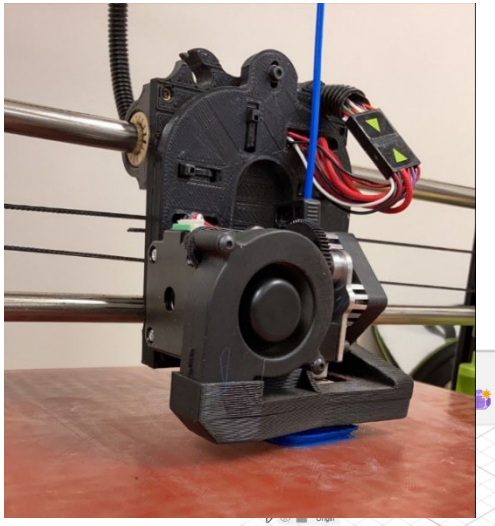
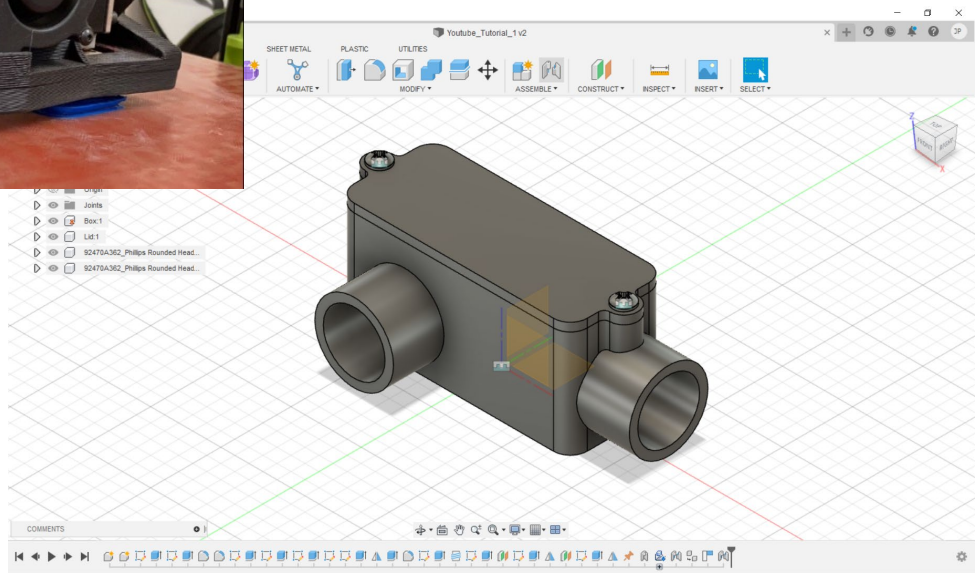
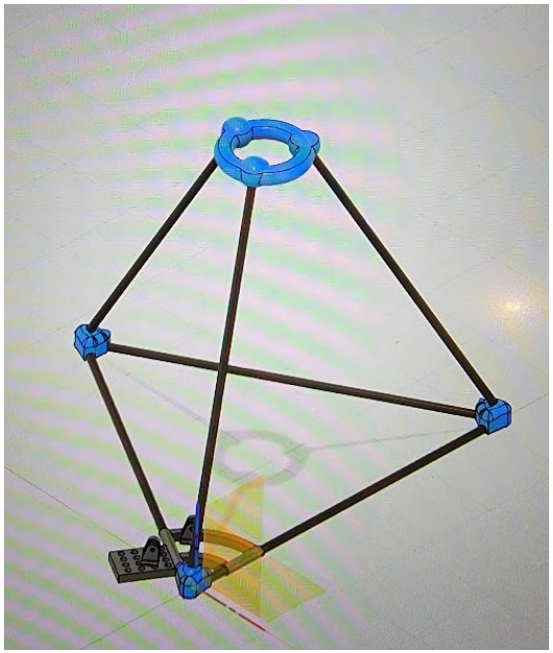
Structure Development



- Fusion360 CAD software
- 3D Print





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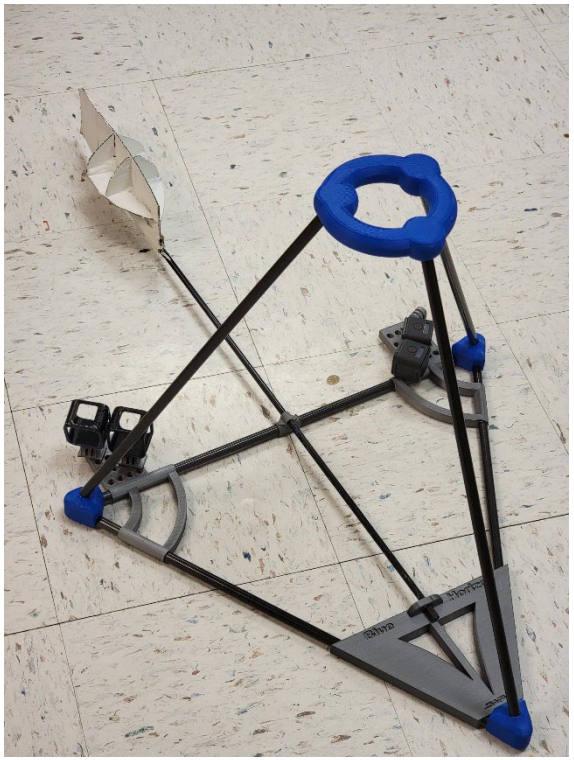
Progress



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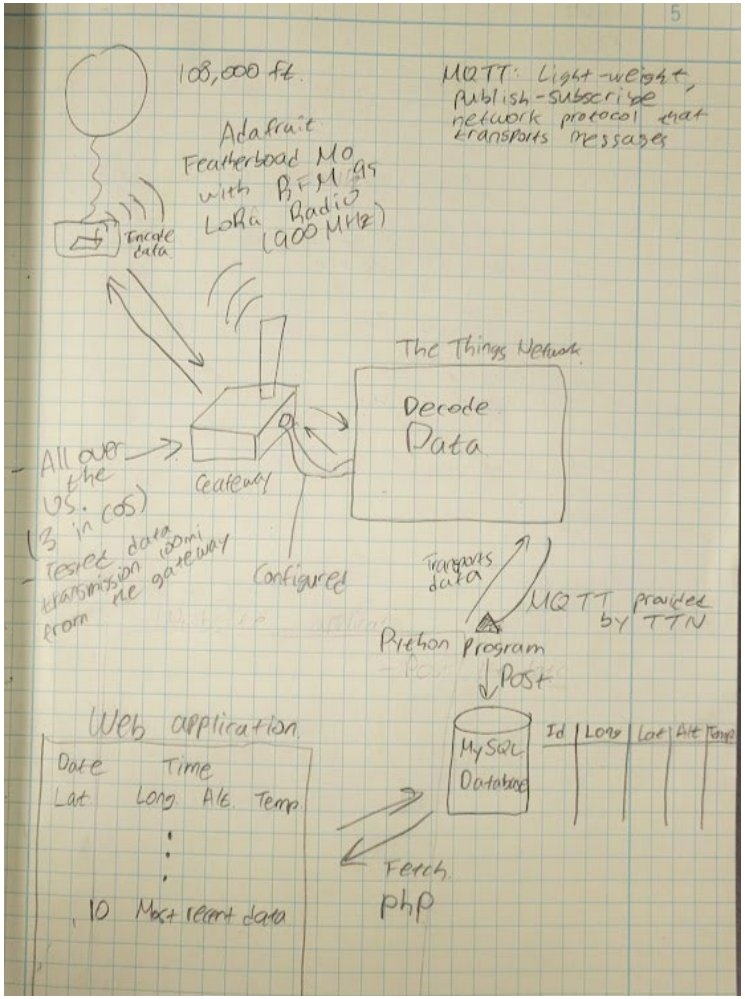
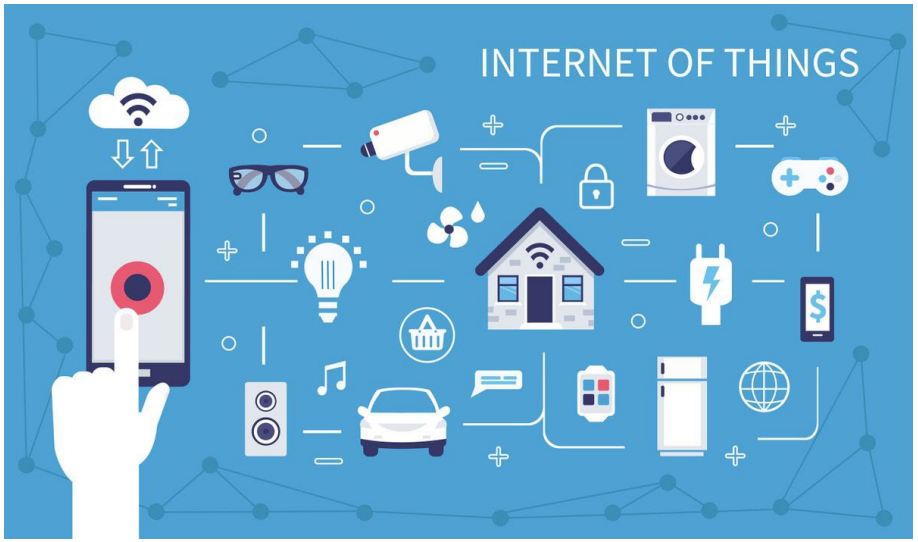
Electronics Infrastructure



- Components
  - Microcontroller
  - GPS
  - Temperature Sensor
  - Internet of Things (IoT)



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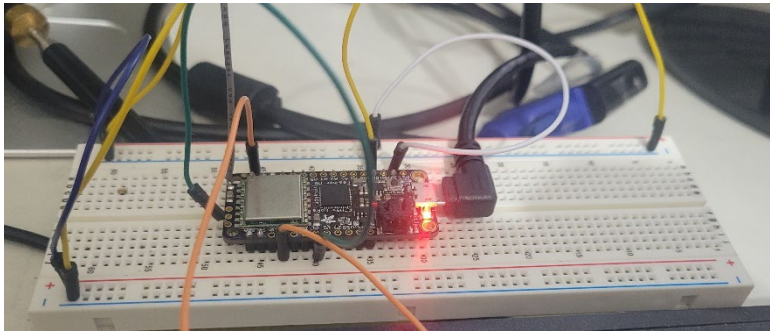
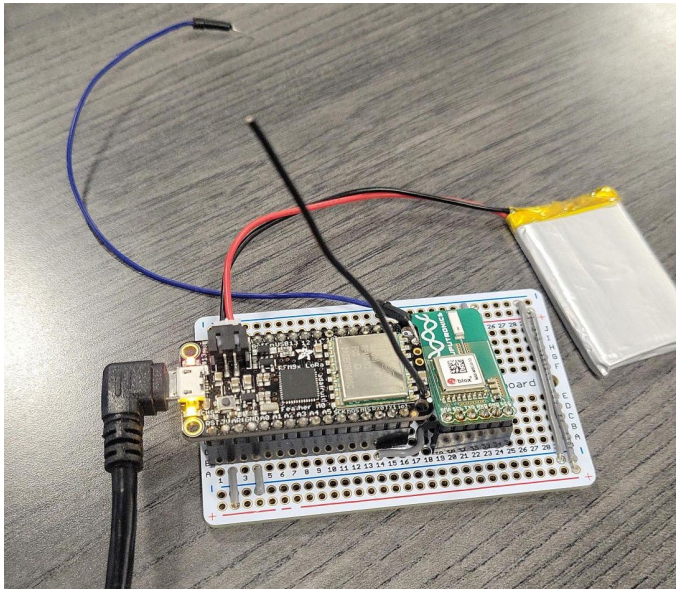
Payload Development



```
Rx1 Delay: 5

MAC payload: 7F 9A 4C 14 16 90 97 F7 …  FPort: 1  Data rate: SF8BW500  SNR: 10.5  RSSI: -36

Payload: { altitude: "0 ft", latitude: "0.0000 N", longitude: "0.00000 W", temperature: "22.75 C" }
```

```
/*******************************************************************************/

#include <lmic.h>
#include <hal/hal.h>
#include <SPI.h>
#include <OneWire.h>
#include <DallasTemperature.h>

#define ONE_WIRE_BUS 12
#define GPSSerial Serial1
#define VBATPIN A7


// Setup a oneWire instance to communicate with any OneWire devices
OneWire oneWire(ONE_WIRE_BUS);

// Pass our oneWire reference to Dallas Temperature.
DallasTemperature sensors(&oneWire);

char radiodata[1000] = {};


// This EUI must be in little-endian format, so least-significant-byte
// first. When copying an EUI from ttnctl output, this means to reverse
// the bytes. For TTN issued EUIs the last bytes should be 0x05, 0x83,
// 0x70.
static const u1_t PROGMEM APPEUI[8]={ 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00 };
void os_getArtEui (u1_t* buf) { memcpy_P(buf, APPEUI, 8);}

// This should also be in little endian format, see above.
static const u1_t PROGMEM DEVEUI[8]={ 0x0A, 0xCE, 0x04, 0x00, 0x7E, 0x05, 0x83, 0x70 };
void os_getDevEui (u1_t* buf) { memcpy_P(buf, DEVEUI, 8);}

// This key should be in big endian format (or, since it is not really a
// number but a block of memory, endianness does not really apply). In
// practice, a key taken from ttnctl can be copied as-is.
static const u1_t PROGMEM APPKEY[16] = { 0xCA, 0xE0, 0x9D, 0x08, 0x87, 0xCA, 0x8A, 0xCD, 0x21, 0xA2, 0xF9, 0x8E, 0x14, 0x88, 0x46, 0x7A };
void os_getDevKey (u1_t* buf) {  memcpy_P(buf, APPKEY, 16);}

static uint8_t mydata[19];
uint32_t LatitudeBinary, LongitudeBinary;

static osjob_t sendjob;
```



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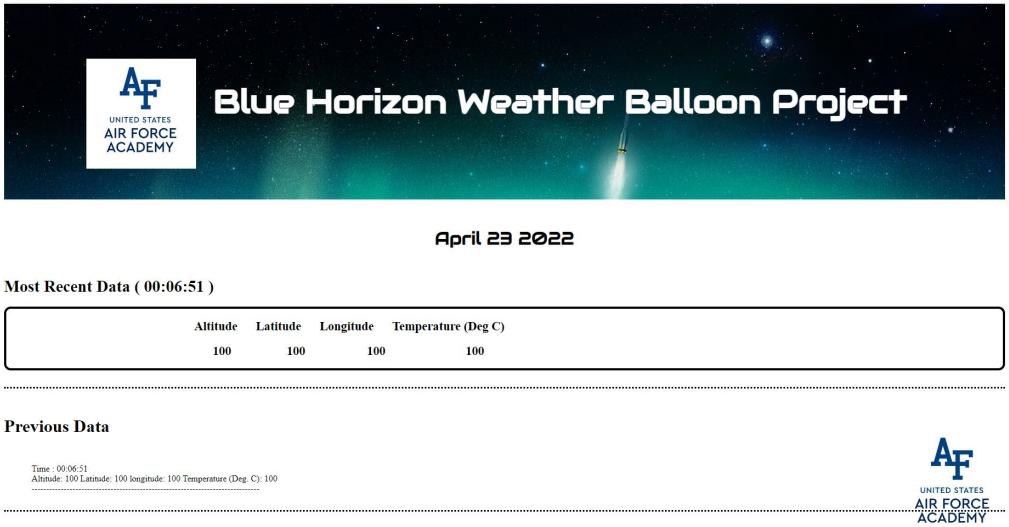
User Interface Development



Editar Copiar Borrar	176	38.988	104.413	658924	18.05	2022-03-03 06:52:11
Editar Copiar Borrar	177	38.9883	104.41	755709	16.25	2022-03-03 06:53:15
Editar Copiar Borrar	178	38.9887	104.407	901867	14.61	2022-03-03 06:55:05
Editar Copiar Borrar	179	38.9888	104.407	921907	14.5	2022-03-03 06:55:20
Editar Copiar Borrar	180	38.9888	104.404	962968	14.18	2022-03-03 06:55:57
Editar Copiar Borrar	181	38.9886	104.403	987899	13.93	2022-03-03 06:56:19
Editar Copiar Borrar	182	38.9875	104.406	558718	13.18	2022-03-03 06:58:01
Editar Copiar Borrar	183	38.9871	104.401	609554	12.05	2022-03-03 06:59:15
Editar Copiar Borrar	184	38.9867	104.386	661368	11.05	2022-03-03 07:00:35
Editar Copiar Borrar	185	38.9861	104.385	677501	10.5	2022-03-03 07:01:05
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Editar Copiar Borrar	187	38.9855	104.383	704873	9.75	2022-03-03 07:01:54

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Launch Day

- 137 ft^3 of helium
- 4.29 kg of lift
- 1000 g balloon
- 900g of free lift
- Liftoff at 0650

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Video

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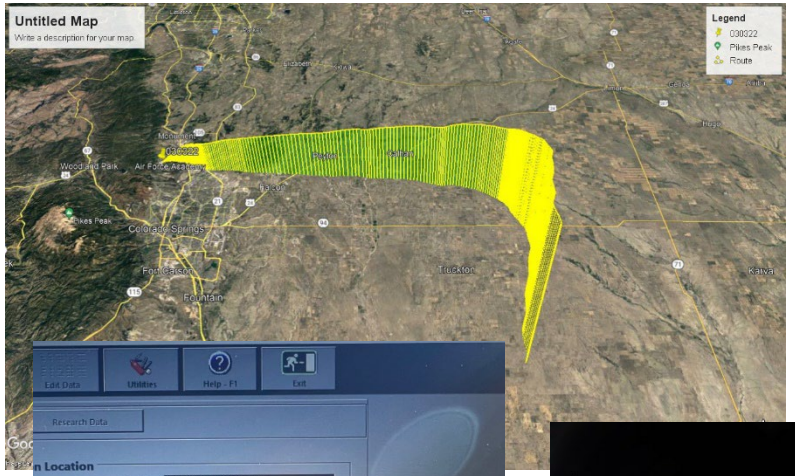
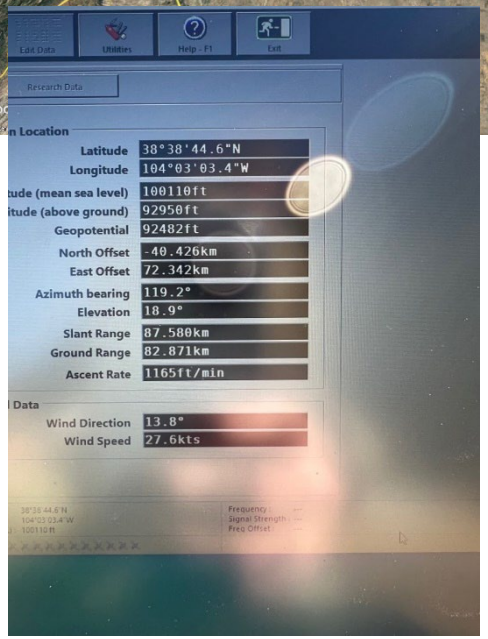
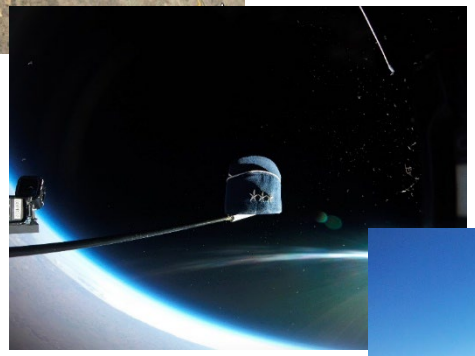
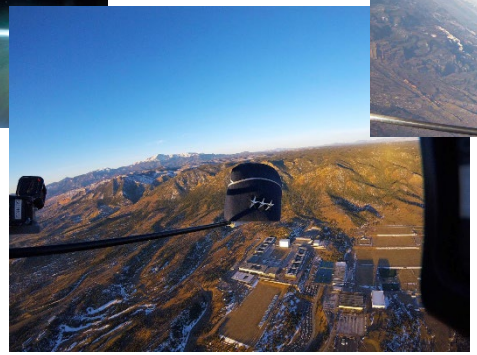
Result









- Apogee 108,000 ft
- Total flight time 2h 8mins 14sec
- Descent time 20mins

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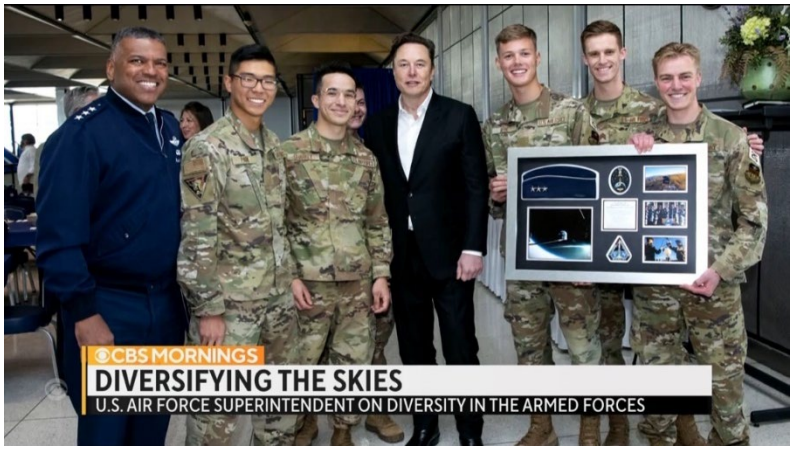
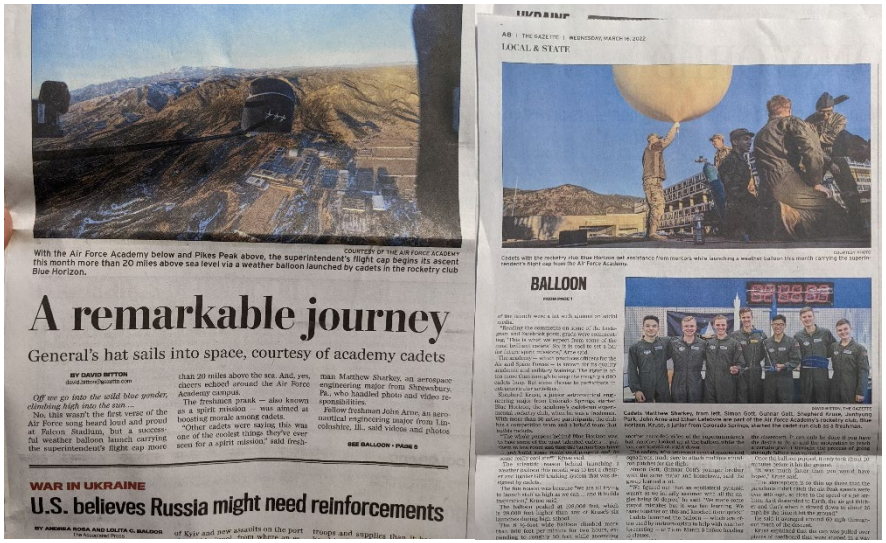
Impacts





With the Air Force Academy below and Pikes Peak above, the superintendent's flight cap begins its ascent this month more than 20 miles above sea level via a weather balloon launched by cadets in the rocketry club Blue Horizon.

COURTESY OF THE AIR FORCE ACADEMY

A remarkable journey

General's hat sails into space, courtesy of academy cadets

BY DAVID BITTON
david.bitton@gazette.com

Off we go into the wild blue yonder, climbing high into the sun...

No, this wasn't the first verse of the Air Force song heard loud and proud at Falcon Stadium, but a successful weather balloon launch carrying the superintendent's flight cap more than 20 miles above the sea. And, yes, cheers echoed around the Air Force Academy campus.

The freshman prank — also known as a spirit mission — was aimed at boosting morale among cadets.

"Other cadets were saying this was one of the coolest things they've ever seen for a spirit mission," said freshman Matthew Sharkey, an aerospace engineering major from Shrewsbury, Pa., who handled photo and video responsibilities.

Fellow freshman John Arne, an aeronautical engineering major from Lincolnshire, Ill., said videos and photos

SEE BALLOON • PAGE 5

WAR IN UKRAINE

U.S. believes Russia might need reinforcements

BY ANGELA ROSA AND LOLITA C. BALDOR
The Associated Press

of Kyiv and new assaults on the port

troops and supplies [illegible]

LOCAL & STATE

Cadets with the rocketry club Blue Horizon get assistance from mentors while launching a weather balloon this month carrying the superintendent's flight cap from The Air Force Academy.

COURTESY OF THE GAZETTE

BALLOON

FROM PAGE 1

of the month were a lot will summer or early

[illegible]

Cadets Matthew Sharkey, from left, Simon Gott, Gunnar Gott, Shepherd Kruse, Jaehyung Park, John Arne and Ethan Lefebvre are part of the Air Force Academy's rocketry club, Blue Horizon. Kruse, a junior from Colorado Springs, started the cadet run club as a freshman.

COURTESY OF THE GAZETTE