Aeromap

Drone Flight Planning Software

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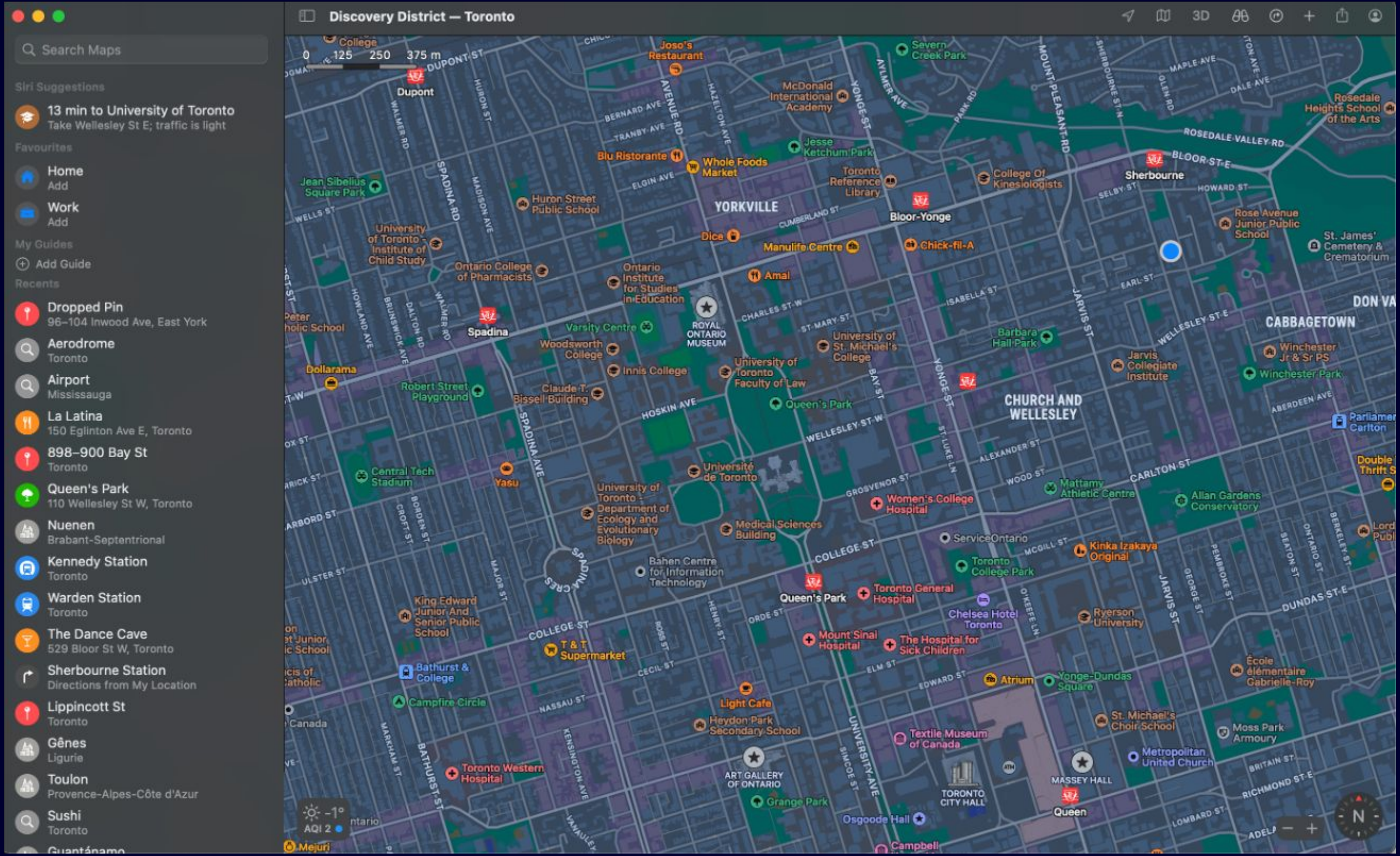
+

U of T Aerospace Team

Partner

We partnered with the U of T Aerospace Team, in particular the Unmanned Aerial Systems division which develops drones.

1. Open Google Maps and 2. find a site (Queens Parks)



Discovery District — Toronto

Search Maps

Siri Suggestions

13 min to University of Toronto
Take Wellesley St E; traffic is light

Favourites

Home
Add

Work
Add

My Guides

Add Guide

Recents

Dropped Pin
96–104 Inwood Ave, East York

Aerodrome
Toronto

Airport
Mississauga

La Latina
150 Eglinton Ave E, Toronto

898–900 Bay St
Toronto

Queen's Park
110 Wellesley St W, Toronto

Nuenen
Brabant-Septentrional

Kennedy Station
Toronto

Warden Station
Toronto

The Dance Cave
529 Bloor St W, Toronto

Sherbourne Station
Directions from My Location

Lippincott St
Toronto

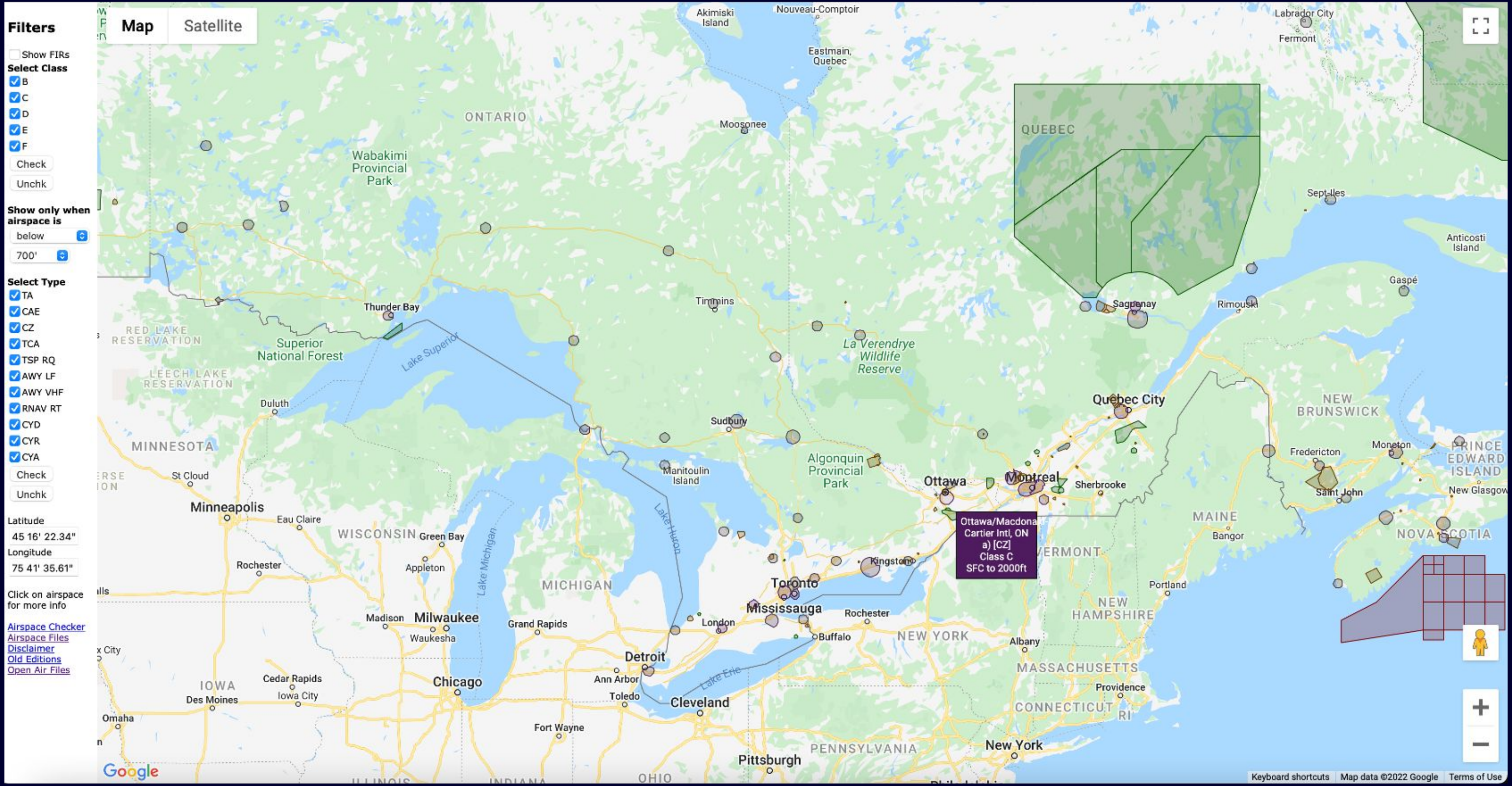
Gênes
Ligurie

Toulon
Provence-Alpes-Côte d'Azur

Sushi
Toronto

3. Find the airspace class

(https://airspace.canadarasp.com)



Filters

- [ ] Show FIRs

Select Class

- [x] B
- [x] C
- [x] D
- [x] E
- [x] F

Check

Unchk

Show only when airspace is

below

700'

Select Type

- [x] TA
- [x] CAE
- [x] CZ
- [x] TCA
- [x] TSP RQ
- [x] AWY LF
- [x] AWY VHF
- [x] RNAV RT
- [x] CYD
- [x] CYR
- [x] CYA

Check

Unchk

Latitude

45 16' 22.34"

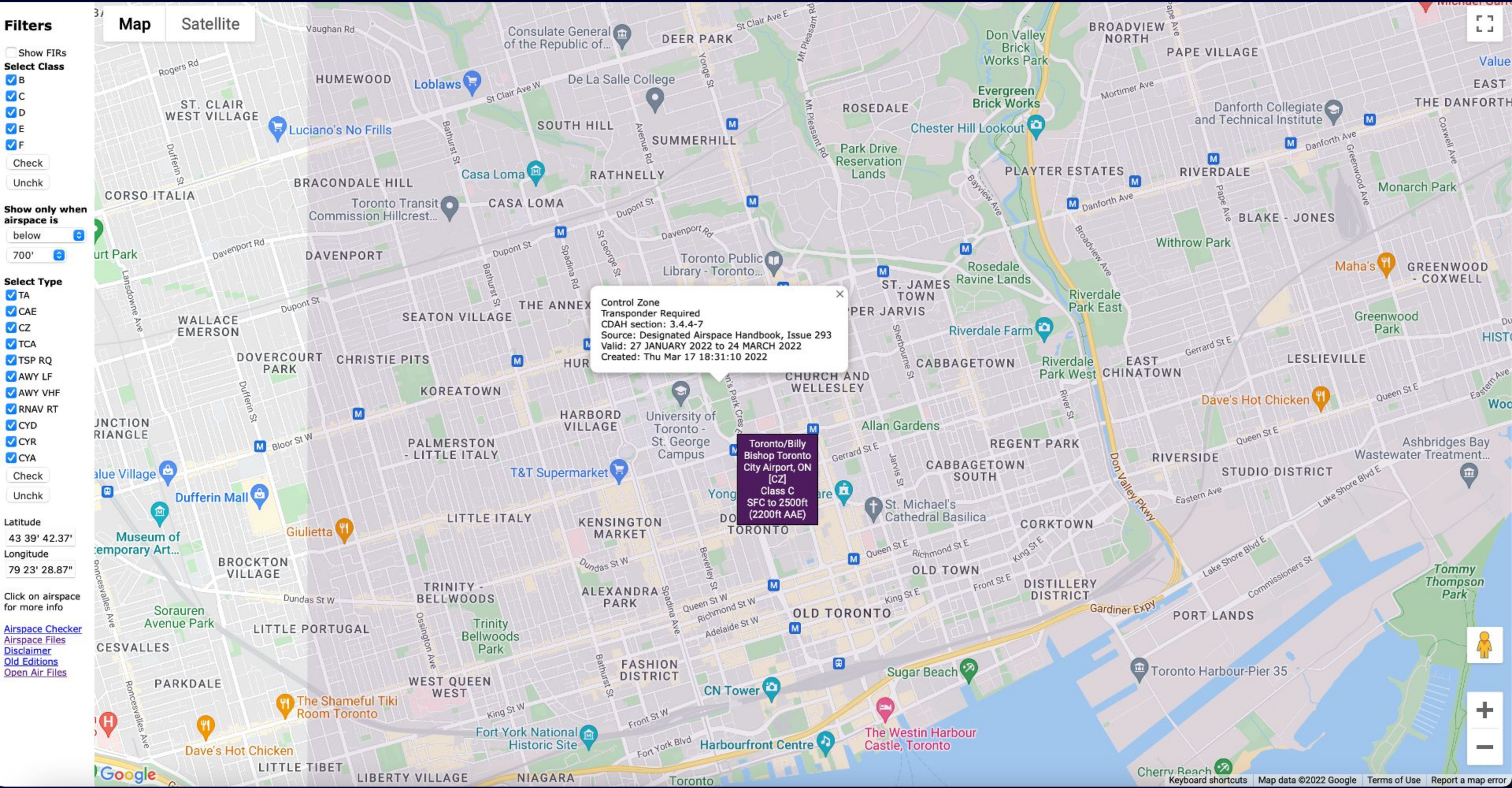
Longitude

75 41' 35.61"

Click on airspace for more info

Airspace Checker
Airspace Files
Disclaimer
Old Editions
Open Air Files

Ottawa/Macdona
Cartier Intl, ON
a) [CZ]
Class C
SFC to 2000ft



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- [x] C
- [x] D
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- [x] F

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- [x] TA
- [x] CAE
- [x] CZ
- [x] TCA
- [x] TSP RQ
- [x] AWY LF
- [x] AWY VHF
- [x] RNAV RT
- [x] CYD
- [x] CYR
- [x] CYA

Check
Unchk

Latitude
43 39' 42.37'

Longitude
79 23' 28.87"

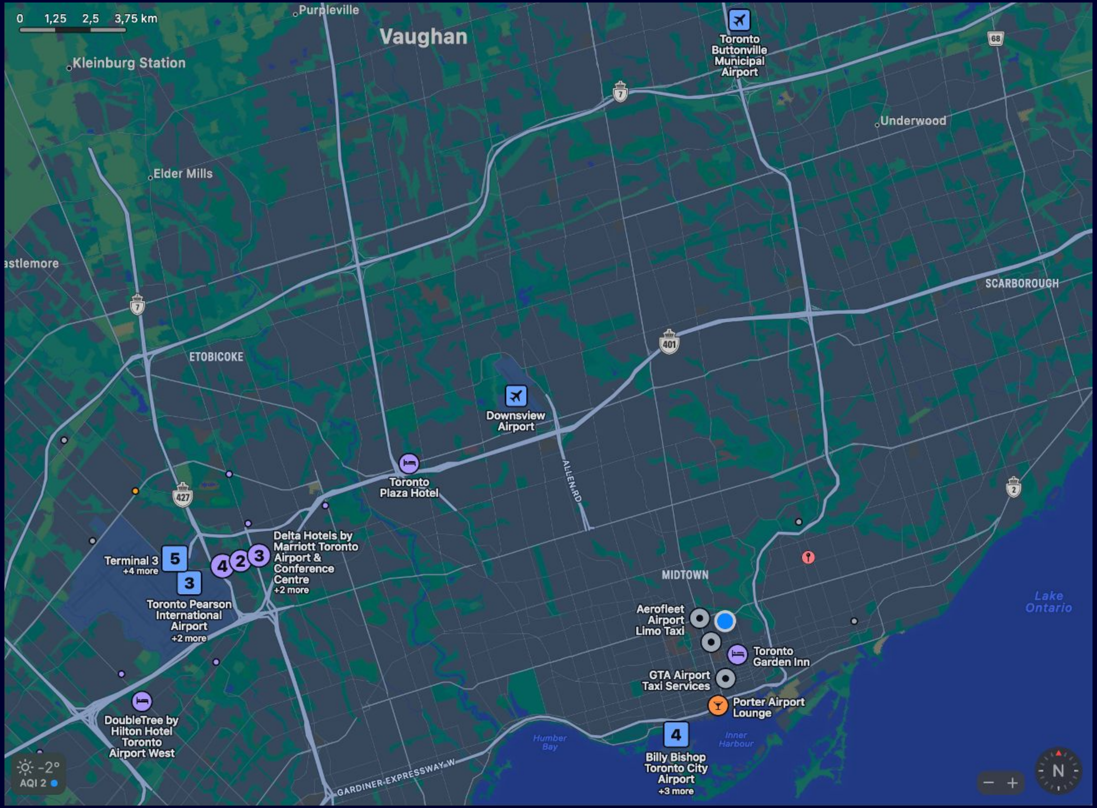
Click on airspace for more info

Airspace Checker
Airspace Files
Disclaimer
Old Editions
Open Air Files

Control Zone
Transponder Required
CDAH section: 3.4.4-7
Source: Designated Airspace Handbook, Issue 293
Valid: 27 JANUARY 2022 to 24 MARCH 2022
Created: Thu Mar 17 18:31:10 2022

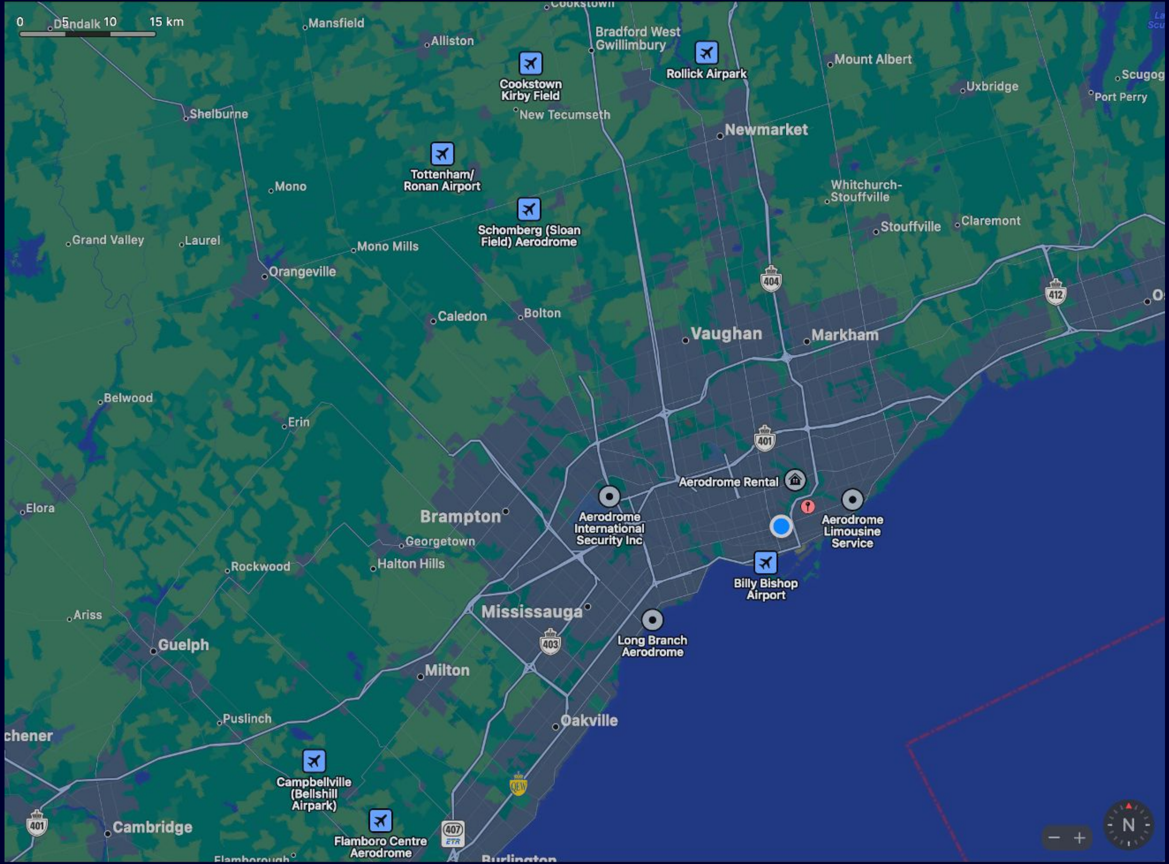
Toronto/Billy Bishop Toronto City Airport, ON [CZ]
Class C
SFC to 2500ft (2200ft AAE)

4. Look for nearby airports


0 1,25 2,5 3,75 km
Purpleville
Vaughan
Kleinburg Station
Toronto Buttonville Municipal Airport
Underwood
Elder Mills
astlemore
SCARBOROUGH
ETOBICOKE
Downsview Airport
Toronto Plaza Hotel
ALLEN RD
Delta Hotels by Marriott Toronto Airport & Conference Centre +2 more
Terminal 3 +4 more
Toronto Pearson International Airport +2 more
MIDTOWN
Lake Ontario
Aerofleet Airport Limo Taxi
Toronto Garden Inn
GTA Airport Taxi Services
Porter Airport Lounge
Billy Bishop Toronto City Airport +3 more
Humber Bay
Inner Harbour
DoubleTree by Hilton Hotel Toronto Airport West
GARDINER EXPRESSWAY W
-2° AQI 2
N

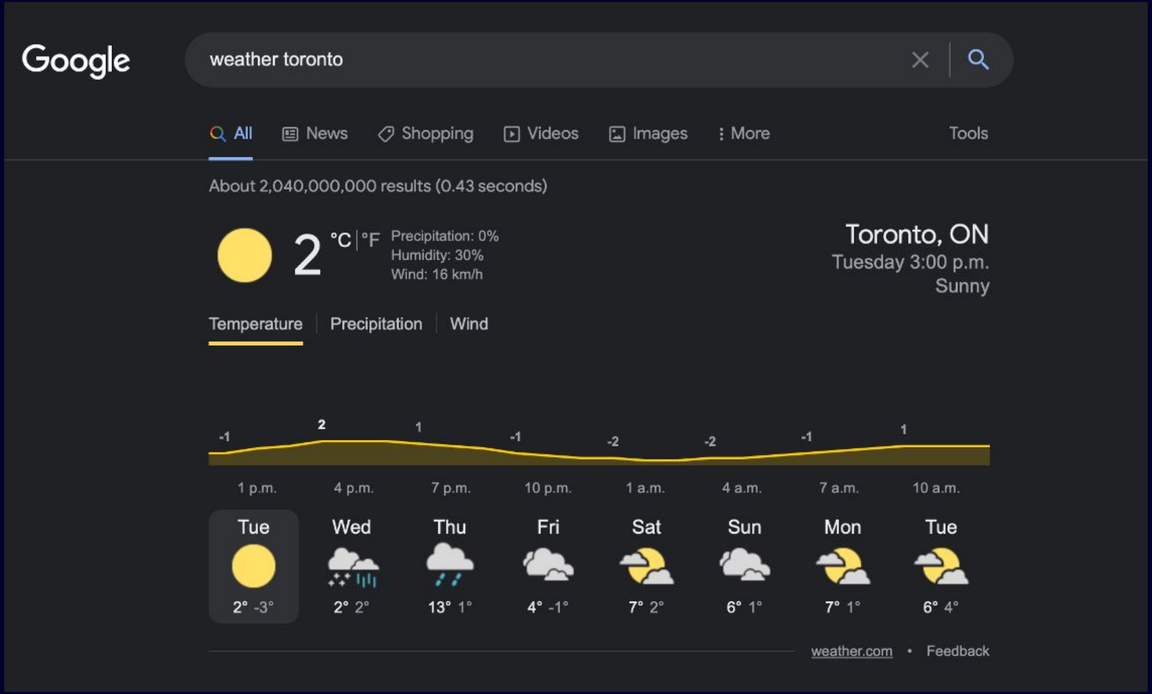
(Have to distinguish real airports from anything with airport in its name)

And nearby aerodromes



5. Look for emergency contacts

6. Look up the weather



About 2,040,000,000 results (0.43 seconds)

2 °C | °F

Precipitation: 0%
Humidity: 30%
Wind: 16 km/h

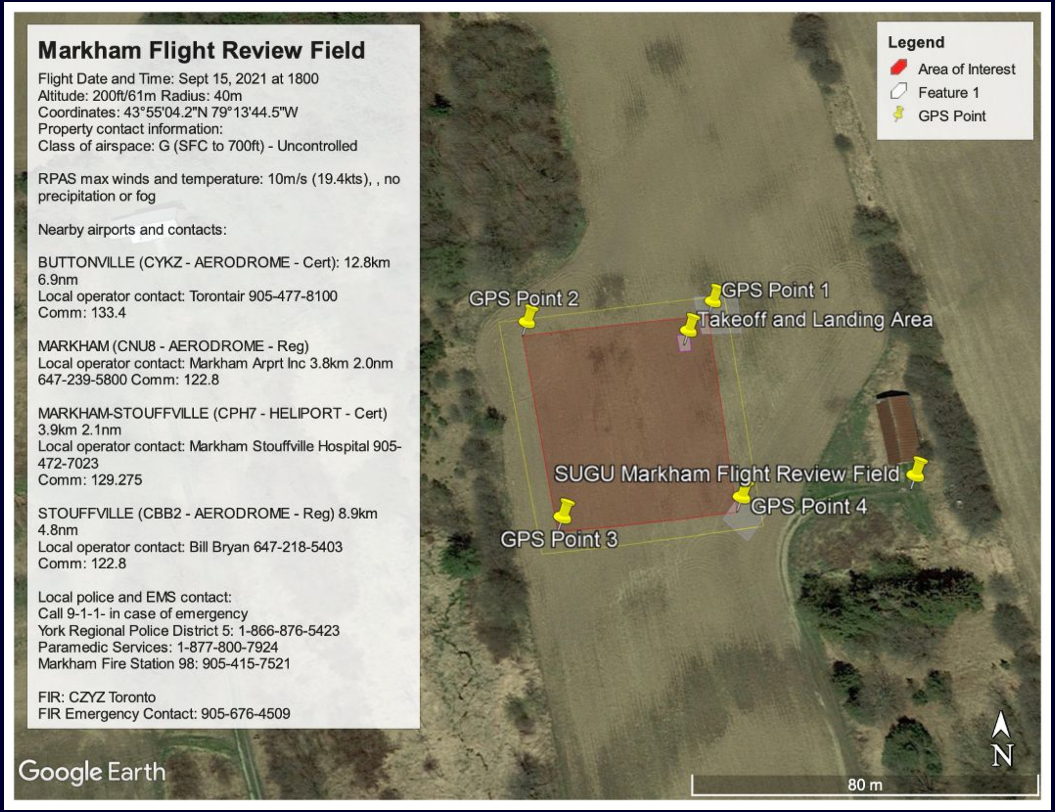
Toronto, ON
Tuesday 3:00 p.m.
Sunny

1 p.m.	4 p.m.	7 p.m.	10 p.m.	1 a.m.	4 a.m.	7 a.m.	10 a.m.
-1	2	1	-1	-2	-2	-1	1

Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue
2° -3°	2° 2°	13° 1°	4° -1°	7° 2°	6° 1°	7° 1°	6° 4°

weather.com • Feedback

7. Make a site survey



Markham Flight Review Field

Flight Date and Time: Sept 15, 2021 at 1800
Altitude: 200ft/61m Radius: 40m
Coordinates: 43°55'04.2"N 79°13'44.5"W
Property contact information:
Class of airspace: G (SFC to 700ft) - Uncontrolled

RPAS max winds and temperature: 10m/s (19.4kts), , no precipitation or fog

Nearby airports and contacts:

BUTTONVILLE (CYKZ - AERODROME - Cert): 12.8km 6.9nm
Local operator contact: Torontair 905-477-8100
Comm: 133.4

MARKHAM (CNU8 - AERODROME - Reg)
Local operator contact: Markham Arprt Inc 3.8km 2.0nm 647-239-5800 Comm: 122.8

MARKHAM-STOUFFVILLE (CPH7 - HELIPORT - Cert) 3.9km 2.1nm
Local operator contact: Markham Stouffville Hospital 905-472-7023
Comm: 129.275

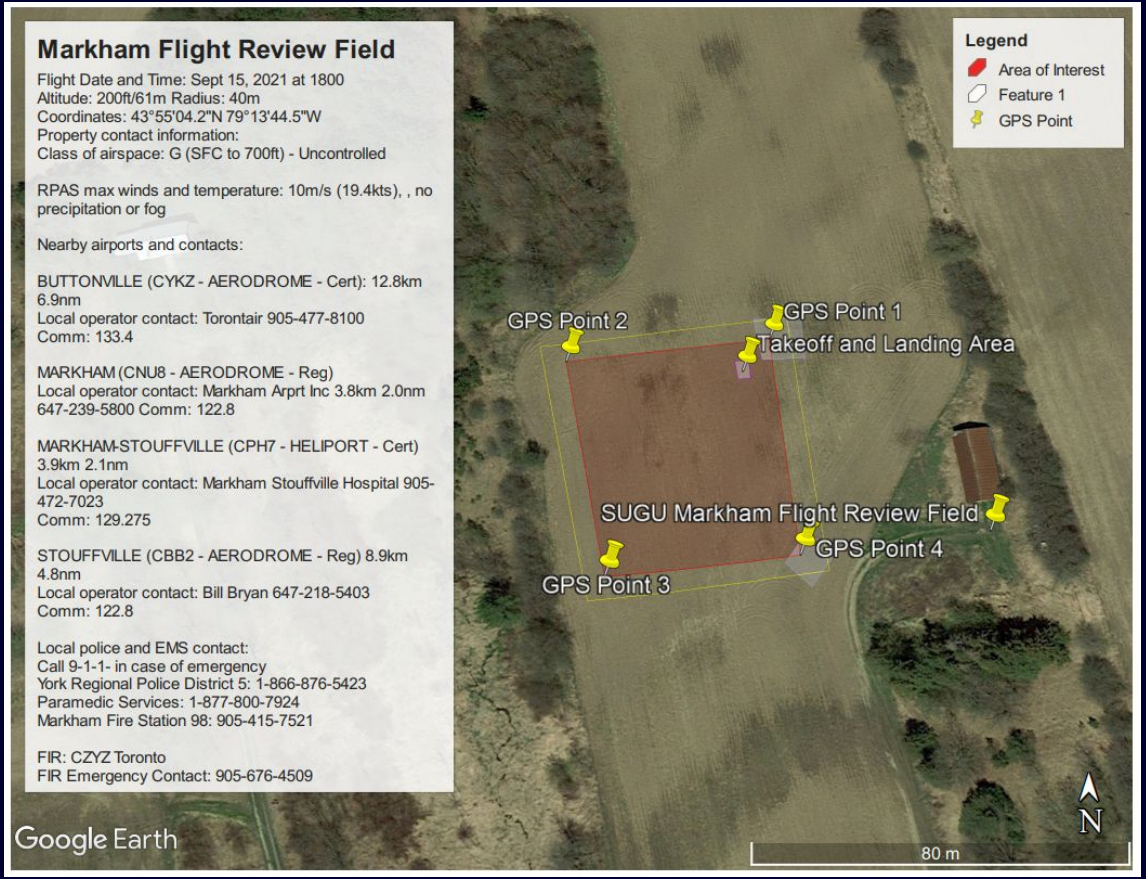
STOUFFVILLE (CBB2 - AERODROME - Reg) 8.9km 4.8nm
Local operator contact: Bill Bryan 647-218-5403
Comm: 122.8

Local police and EMS contact:
Call 9-1-1- in case of emergency
York Regional Police District 5: 1-866-876-5423
Paramedic Services: 1-877-800-7924
Markham Fire Station 98: 905-415-7521

FIR: CZYZ Toronto
FIR Emergency Contact: 905-676-4509

Specifications

- Able to be brought out to the field (offline)
- Extract/display aerodrome, airspace and weather information for a site
- Log flight and drone information
- View upcoming and past flights



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Our solution

We created a desktop application which consists of an intuitive navigation bar and 4 pages:

Upcoming Flights: displays upcoming flight information

Site Planner: user can place markers and draw shapes on a map which displays local weather and aerodrome/airspace information

Add Flight: for entering information for a future flight

Flight History: displays past flight logs

Demo

Technical Discussion

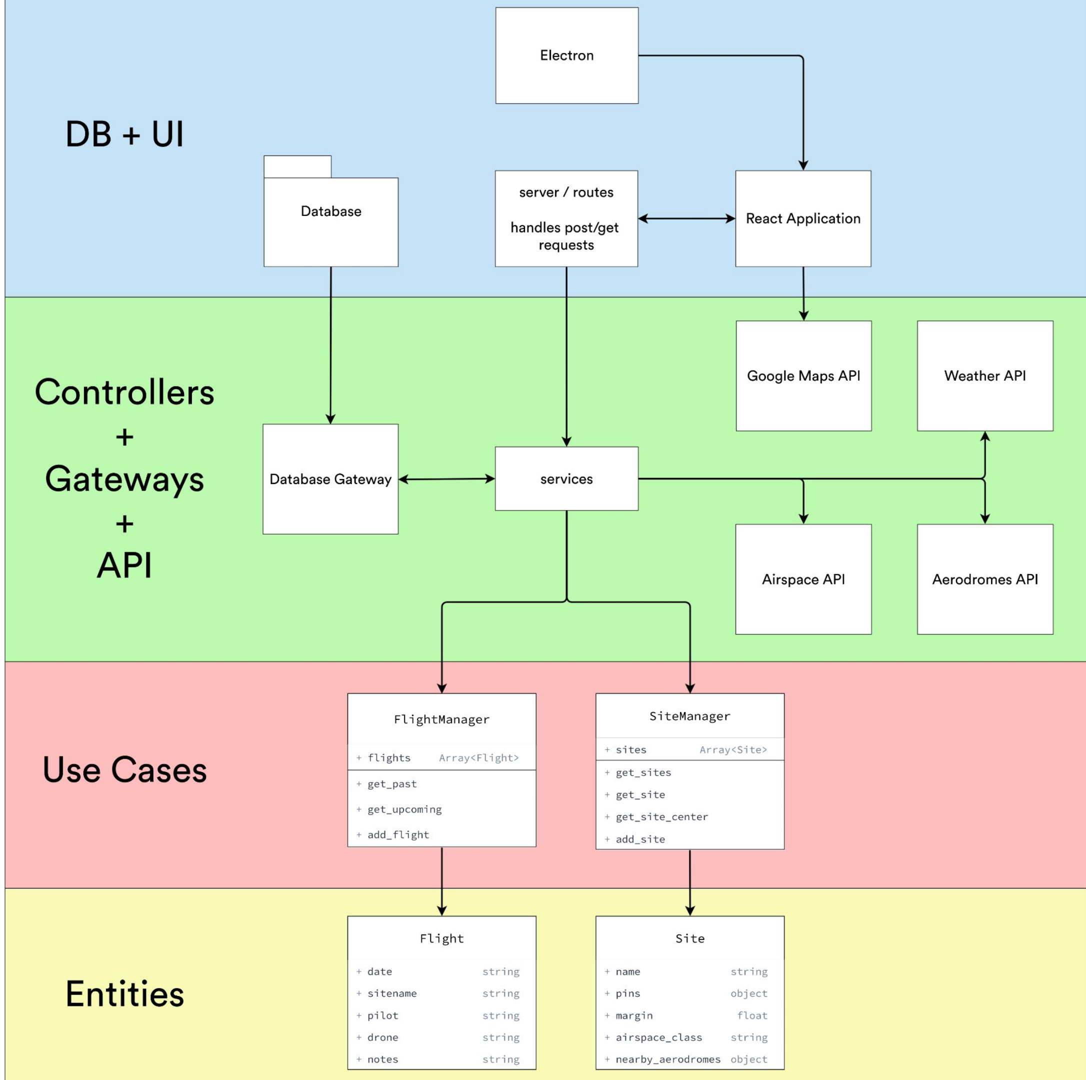
Frameworks:

Frontend

react + electron

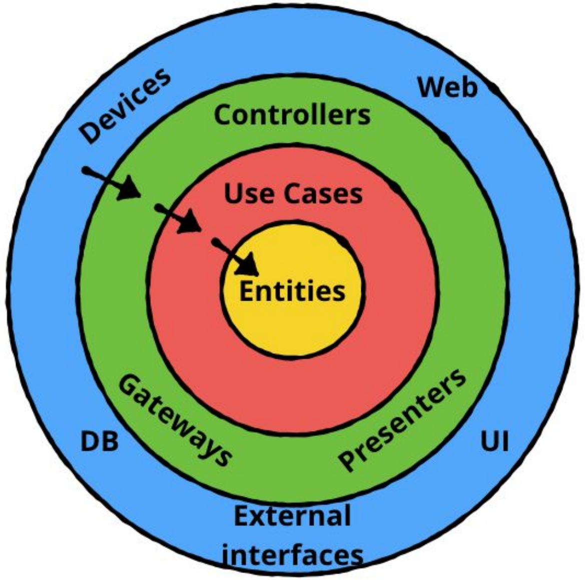
Backend

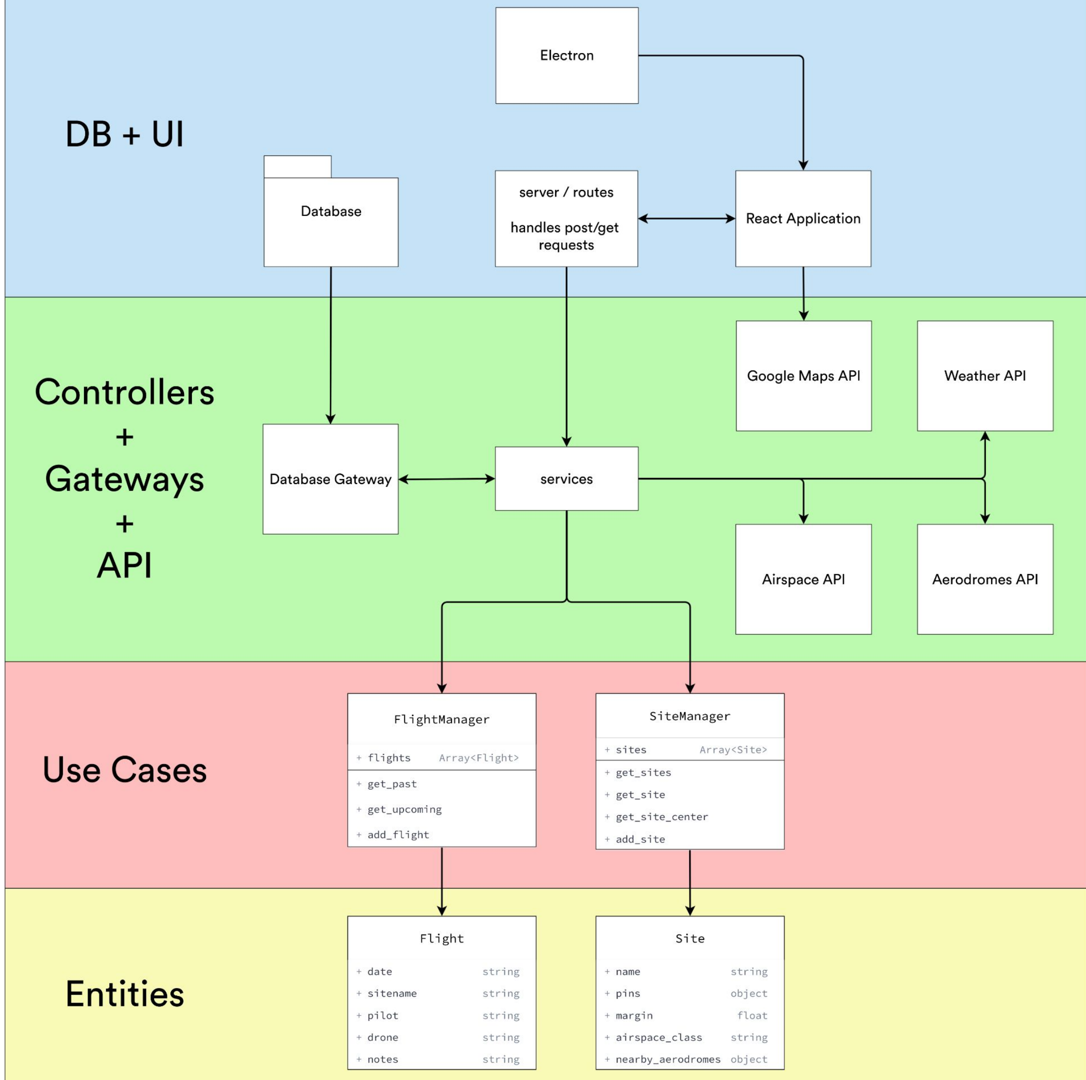
node js + express



Technical Discussion

Clean Architecture

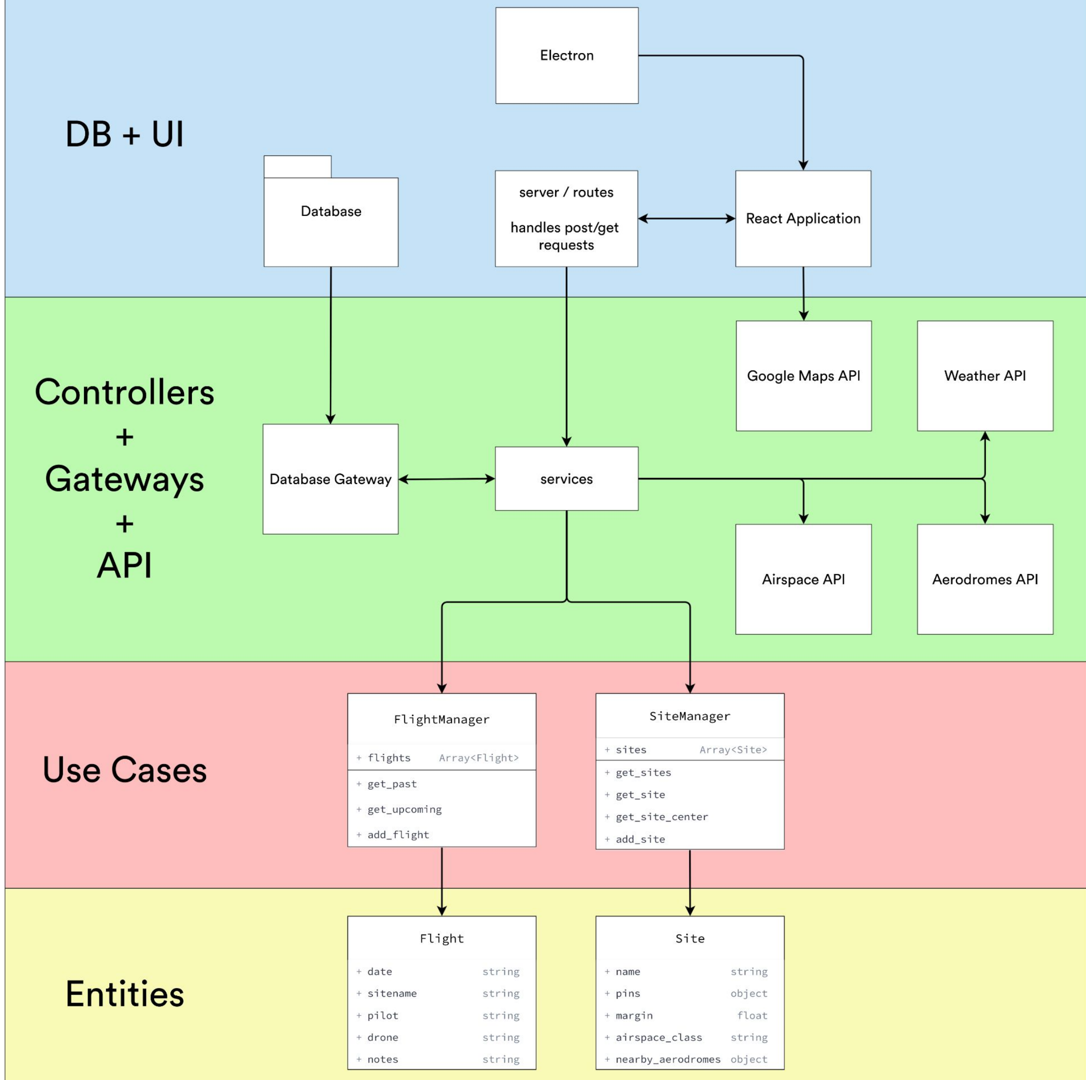




Technical Discussion

Useful Ideologies and Design Patterns

- Dependency Rule
  - Benefits:
    - Easy Testing
    - Easy Debugging
    - Readable code
- Facade
  - Frontend interacts with a very simple API
  - Hides Complexity
  - Easy to use



Process - Workflow

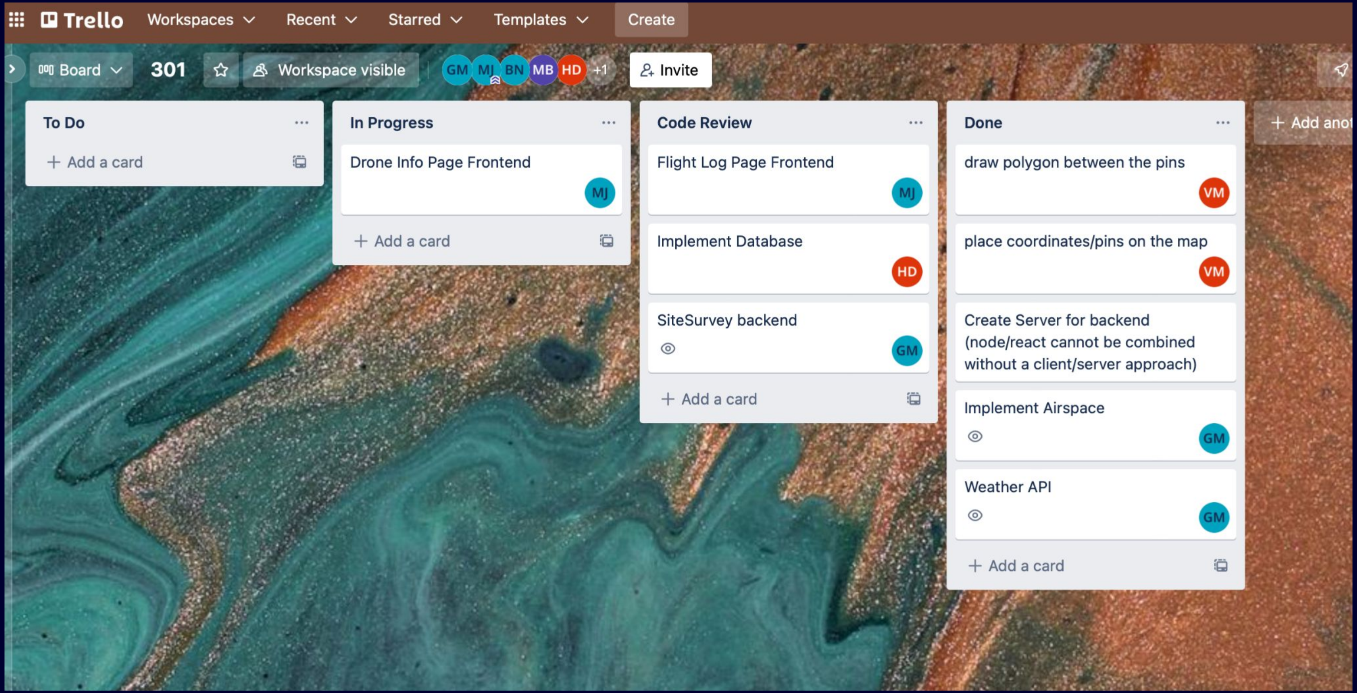
1. Establish a clear description of the application’s goals and define priorities for features

2. Roles assignation $\rightarrow$ “backend” team; $\rightarrow$ “frontend” team

3. Meetings schedule $\rightarrow$ Too flexible

Process - Trello

4. Trello → Simple workflow for precise tasks assignment and completion



To Do
- + Add a card

In Progress
- Drone Info Page Frontend (MJ)
- + Add a card

Code Review
- Flight Log Page Frontend (MJ)
- Implement Database (HD)
- SiteSurvey backend (GM)
- + Add a card

Done
- draw polygon between the pins (VM)
- place coordinates/pins on the map (VM)
- Create Server for backend (node/react cannot be combined without a client/server approach)
- Implement Airspace (GM)
- Weather API (GM)
- + Add a card

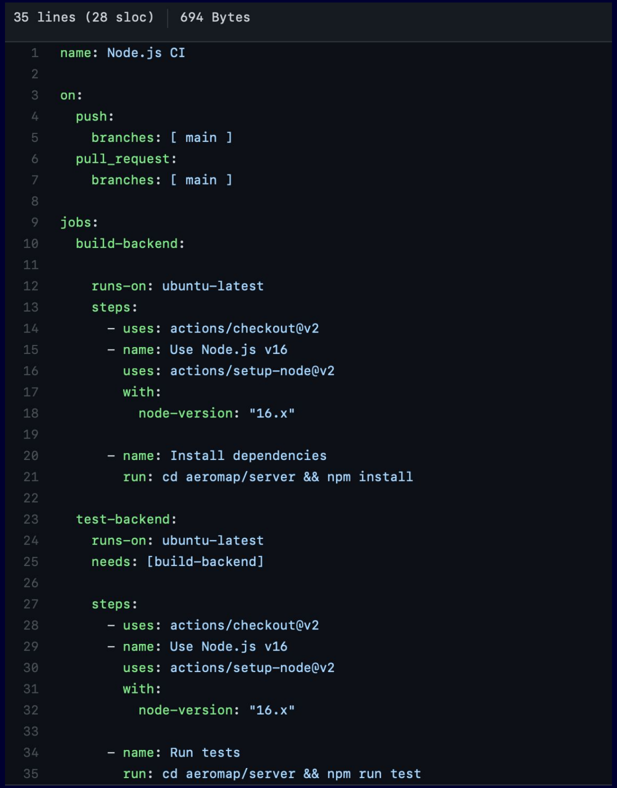
+ Add anot

Process - CI/CD

5. CI/CD

CI: Automated testing to ensure that new code pushed to main branch doesn't break the application

CD: packaging the application in a executable file (ideally, missing at the moment)



35 lines (28 sloc) | 694 Bytes

```yaml
name: Node.js CI

on:
  push:
    branches: [ main ]
  pull_request:
    branches: [ main ]

jobs:
  build-backend:

    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v2
      - name: Use Node.js v16
        uses: actions/setup-node@v2
        with:
          node-version: "16.x"

      - name: Install dependencies
        run: cd aeromap/server && npm install

  test-backend:
    runs-on: ubuntu-latest
    needs: [build-backend]

    steps:
      - uses: actions/checkout@v2
      - name: Use Node.js v16
        uses: actions/setup-node@v2
        with:
          node-version: "16.x"

      - name: Run tests
        run: cd aeromap/server && npm run test
```

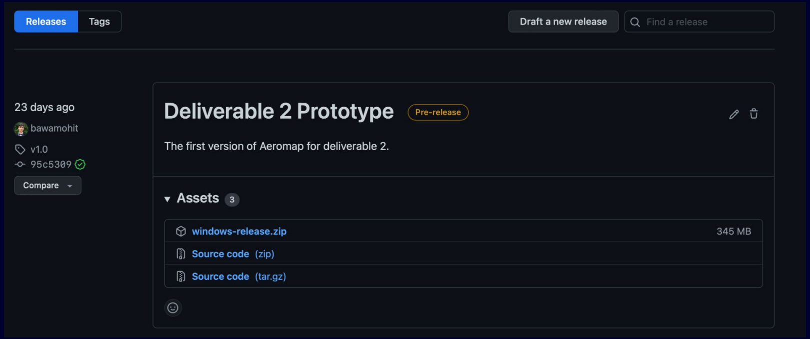
Accessing the application

- Repository made available to the partner for code access

- GitHub release so that the user can directly download the package containing the executable (windows .exe file)

- Meeting with the partner for explanations related to application installation and usage

- Provide a brief instruction guide for both application setup and usage



23 days ago
bawamohit
v1.0
95c5309

Deliverable 2 Prototype

The first version of Aeromap for deliverable 2.

Assets 3

windows-release.zip	345 MB
Source code (zip)	
Source code (tar.gz)	

How did we work together?

We split into 2 teams: the frontend team and the backend team

- Each team had 3 members in the beginning
- Eventually each team has 2 core members, and 2 members were switching back and forth to connect the 2 components

Our main method of communication to set meetings and talk to each other is a Discord server, with a channel for each team

What did we change midway?

Originally, for simplicity, our frontend folder just imports and uses all the backend logic. We realized this isn’t ideal so we separated the frontend and backend and communicate between them using a server.

The backend team had trouble communicating and knowing their tasks, so Max stepped up and used Agile methodology to assign everyone weekly tasks.

Individual Contributions

Max: UI

Mohit: Backend Architecture, Connecting Frontend to Backend

Gregoire: Backend Design, Weather Controller (API), Airspace API,

Entities (Airspace, AirspaceLoader, geometry package, map package, util package)

Peter: Backend Architecture, Server, Database, Aerodrome API

Victor: Maps API, Development of map UI