These technical FAQs are designed to help you better formulate and submit your ideas. These FAQs provide information on questions raised by applicants to date for each Challenge area.

Technical FAQs are also available on the Challenge area pages.

Note that technical questions for **all Challenge areas are included below**, so please scroll through to find answers to your specific technical questions. If you have scrolled through all available technical FAQs and still do not see an answer to your question, please email us at GeniusChallengeInfo@mtahq.org.

1. What type of door systems are fitted? Is there a manual and/or are there drawings available?

The door systems on New York City Transit passenger cars can be grouped into three categories as described below. Door systems on all cars employ the same basic structure for operating commands and status indication, and all systems employ obstruction detection systems to mitigate incidents of drags.

- Under-seat door operator configuration (car models R32 and R42): Door operators are mounted under the passenger seats to the floors of the cars. Center door operators drive two panels in adjacent door openings through mechanical linkages, while corner door operators open and close single panels at the ends of the car. Door panels are suspended by roller-bearing tracks attached to the door header car structure.
- Wall-mounted door operator configuration (car models R46, R62, R62A, R68, R68A): Door operators are mounted through a baseplate to the sidewall structure of the car. Each door operator controls a single panel through mechanical linkages. Door panels are suspended by roller-bearing tracks attached to the door header car structure.
- Overhead drive door operator configuration (car models R142, R142A, R143, R160, R179, R188): Door operators are mounted to an integrated baseplate which includes screw-drive mechanisms and roller tracks. Door panels are suspended from these roller tracks. The integrated baseplate in turn is mounted to the car structure.

2. What type of door failure modes have been experienced or are known?

Door failure modes fall into two categories:

- Electrical: Failures in electrical drives or controls, such as limit switches or relays, shut down the door system or fail to confirm to the train crew that the doors are closed and locked.
- Mechanical: Failures of electro-mechanical or mechanical components, such as drive linkages and locking mechanism, shut down the door system or fail to confirm to the train crew that the doors are closed and locked. These failures may be caused by vandalism.

3. How many door failures have been experienced and what is the impact to revenue service/customers of each?

The number of door failures per month varies widely by month and by car class. The impact on revenue service depends on whether the car must be removed from revenue service to make the repair, which would require pulling the entire train out of service; or if the door panel can be repaired in the field while keeping the train in service.

4. How are the door failure instances tracked currently? What is being done to address them?

All door failures are logged and addressed at the maintenance facility.

5. What data (frequency, volume) is available per door cycle?

Door systems on recent car models, such as the R142, capture and record door failures that affect safety and reliability, such as notices of unauthorized commands or failure of a proximity switch.

6. Are the conditions/factors contributing to door function deterioration known and if so what are they?

- Mechanical/electrical wear and tear: A typical car door will open and close hundreds of thousands times within the 7-year maintenance cycle. Mechanical drive mechanisms, electrical relay contacts, gears, and motors are all impacted by the heavy usage.
- Vandalism: Vandals are a common cause of door failures.

7. Can you provide the wayside signal braking model referenced in the signal engineering documents?

Please see: Brake Stopping Distance.pdf

This curve forms the basis of all wayside signal design stopping distances. The distances have to be adjusted for grades because grade has a significant affect. The safe braking distance is generally 35% longer than the emergency braking distance.

For communications-based train control (CBTC), the safe braking algorithm is developed by the suppliers of the CBTC technology. It typically includes latencies in CBTC system processing and communications and vehicle system response. As with most automatic train control systems, it includes the distance traveled before brakes are fully applied.

8. We want to provide real-time train information through an app. Would we be required to provide the Wi-Fi services that connect with our app or would a third party be able to implement the Wi-Fi services?

Currently, all subway stations have Wi-Fi connectivity. The tunnels do not yet have such connectivity (this is set forth under “Core Objectives of Challenge 3”). To the extent Wi-Fi services are deployed throughout the tunnels, such an app would be able to leverage these systems, subject to MTA policies and procedures.

9. What is the type of fiber optic cable installed in the tunnels (single or multi-mode and wavelength)? Number of strands? Date installed?

MTA has both single mode and multimode cables installed in tunnels. For communications systems, only single mode is used. Multimode is used for certain signals projects only. The single mode fiber cable used is the conventional non-dispersion shifted fiber according to ITU-T G.652. The majority of equipment uses 1310 nm, however DWDM and ROADM equipment operates in the 1550 nm range.

The majority of fiber cables are 12-strands. Newer cables are 36-strands. However, most of the 36-strand cables are spliced to a 12-strand fiber cable inside the tunnel, so the effective usable strands remain 12. Generally, there are no available fiber strands in our backbone fiber optic plant. The 12-strand fiber cables were originally installed in the late 1980s to early 1990s.

10. What types of RFID transponders and readers are used for the Automatic Train Supervision (ATS) system in the A Division?

The A Division uses an Automatic Vehicle Identification (AVI) system.

11. What type of track circuit equipment is in use?

Track circuits consist of two insulated joints for isolation from adjacent track circuits, four track wires, two resistors, two fuses, two matching transformers, and a track relay.

12. What type of CBTC tachometer and inertial measurement unit (IMU) are used on the 7 Line?

The speed measuring system on this line uses "Hall effect" speed sensors and accelerometers.

13. What type of CBTC distance measuring method is used on the Queens Boulevard Line?

The Queens Boulevard Line uses a dual tachometer-based system and dual accelerometers. The speed measuring system on this line uses "Hall effect" speed sensors.

14. What is the outside diameter of the steel hand stick for passengers in the car?

Generally, cars constructed prior to 2000 have handrails that measure 1.25" in diameter and vertical or center stanchions that are 1.68" in diameter. Cars constructed after 2000 have handrails that measure 1.25" in diameter and vertical or center stanchions that are 1.5" in diameter.

15. What is the approximate time duration of the D Line from Coney Island-Stillwell Avenue to Kingsbridge Road?

It varies, but it is approximately 90 minutes from Coney Island-Stillwell Avenue to Kingsbridge Road.

16. What is the size (width and length) of the flat surface of the car ceiling?

There is very little flat surface on the ceilings of our cars. HVAC vents, air inlet ports, speakers, and lighting take up a substantial portion of the visible ceiling.

17. In Section 4.1 (a) of the Terms and Conditions, you state that one core objective for Category 1 (Improve Subway Signaling) is to "accelerate dramatically the deployment of CBTC or a related version of such technology". As MTA/NYCT has qualified Siemens and Thales to be their CBTC suppliers according to NYCT specifications, is a related version of such technology any CBTC product that can be provided by any company as long as it meets IEEE 1474 definition?

It took nearly seven years to install CBTC on the Canarsie and Flushing lines. MTA has 24 lines. We need a solution that will address our needs much faster. We are looking for innovative train control solutions that may include leapfrog technology.

18. Which list of cost rates is usually referred to regarding the New York City subway?

Please see: 220 Schedule of Prevailing Rates 2017-2018 and Federal Wage Rates NY.

19. Which types of braking (air brakes, friction brakes, or electric brakes) are included in the emergency brake curve, by fleet?

All fleets have friction braking.

20. What type of maintenance vehicles or cars are allowed in the underground track areas? Does MTA allow high-rail carts attached to diesel light trucks to be used for maintenance on active revenue tracks?

Flat cars, diesel locomotives, and high-rail carts attached to diesel light trucks are the only maintenance vehicles permitted in the underground track areas. Use of high-rail carts is very limited.

21. The signal system deployed on the L Line used CBTC and fixed-block at the same time. After completion of CBTC, the fixed-block equipment is still present.

Will any proposed replacement to CBTC be required to operate along with fixed-block equipment?

Proposed solutions are not required to use or accommodate the existing fixed-block equipment.

22. In a worst case scenario, what is the sharpest turn angle in current tunnels with no line of sight?

- IRT Line: 144 foot radius
- IND Line: 277 foot radius
- BMT Line: 167 foot radius

23. What are the technical and what are the operational differences between Canarsie, Flushing, and Queens Boulevard Lines' CBTC systems and how are they interoperable with each other?

The Canarsie Line CBTC system (Siemens) and the Flushing Line CBTC system (Thales) differ in that the Canarsie Line CBTC system uses fixed virtual blocks whereas the Flushing Line CBTC system uses moving blocks for safe train separations. Both designs comply with New York City Transit's Interoperability Interface Specification (IIS) and have equivalent performance with regard to safety, throughput, and operational requirements.

24. Is it feasible to propose a device that uses power from the third rail?

Yes, but there are significant safety risks that would have to be addressed.

25. What are the type and number of subway cars that have free axle tachometers or odometers?

The R188 fleet (506 cars) and R179 fleet (300 cars) have free axles.

26. How long did it take to install CBTC on the Canarsie (L line) and the Flushing (7 line)? What was the necessary timeframe for CBTC installation on the Canarsie and Flushing lines? For how many days or hours did each of these lines have to be shut down in order to install CBTC?

- <u>Flushing Line:</u> Installation was performed over a 7-year period. It required approximately 3,700 hours of weeknight shutdowns and 3,200 hours of weekend shutdowns.
- <u>Canarsie Line</u>: Installation was performed over a 6-year period and required weeknight and weekend shutdowns.

27. What is the clearance for A Division (IRT) cars and B Division (IND/BMT) cars relative to the tunnel cross beams? What is the the catwalk clearance for divisions A and B?

The vertical structural clearance line minimum distance to the underside of the subway roof or mezzanine floor for both A and B Divisions range from 12’-6-3/8” to 12’-9-1/8".

Note that clearances are increased on vertically curved track to accommodate car center (sag) and end (crest) excesses.

The lateral structural clearance line from the gauge face of the running rail on the tangent track to the edge of the high bench (bench-walk between stations) is as follows:

- A Division: 2’-9-3/4”; to face of curtain wall supporting high bench is 3’-1-3/4”
- B Division: 3’-1-3/4”; to face of curtain wall supporting high bench is 3’-4-3/4”

Note that clearances are increased on curved track to accommodate car center and end excesses.