

CAESAR Site Survey

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A team from NCAR and the University of Miami traveled to Kiruna and Stockholm, Sweden to perform a site survey for the upcoming CAESAR field project. In Kiruna the team met with airport operations staff, toured the Arena Arctica hangar, looked at hotel options, and familiarized themselves with support options in the city for logistics and personnel comfort. Following that visit the team flew to Stockholm in order to meet with US Embassy personnel there to brief them on project preparations, discuss progress on diplomatic clearances for the C-130, and get information on shipping and importing project support equipment.

Location

After a preliminary site survey to Scandinavia in Fall 2022 Kiruna, Sweden was chosen as the base of operations for CAESAR. The airport has a hangar of suitable size for the C-130 and has been used for airborne field campaigns by NASA, NOAA, DLR, FAAM, Safire, and others. Kiruna is a city of approximately 26,000 people located in the northern part of Sweden, at approximately 68.7 °N. The city is a mining community but also draws a large number of tourists, especially in winter, for activities such as Aurora Borealis viewing and winter sports.

Travel to Kiruna

Kiruna is located approximately 600 miles north of Stockholm, Sweden. The airport is served by Scandinavian Airlines with 2-3 flights per day from Stockholm depending on the day of the week and the season. Travel to Europe almost always requires an overnight flight from the US, arriving early in the morning. As of May 2023 there are direct flights to Stockholm from the US originating in Chicago, New York, and Miami, meaning most travelers will require a stopover. That stopover can also be done in Europe as there are flights to Stockholm from all major European cities, including Madrid, London, Paris, Munich, Frankfurt, and Amsterdam, which are reachable non-stop from many more US cities. Regardless, most travelers will require at least 2 stops to get to Kiruna. Depending on the arrival or departure times in Stockholm it may also be necessary to spend a night there due to the limited number of flights to Kiruna. The Kiruna airport is also closed on Saturdays (research flights will be possible) so travel should be planned accordingly to avoid arrivals and departures on that day.

For US and European citizens, no special visa requirements exist for entry into Sweden for stays less than 90 days. To be safe, you should make sure your passport is valid for at least six months after the end of your stay. Residents of some countries require a Schengen Visa, which

can be obtained with the assistance of your Embassy. Please see the website below for a list of such countries and more information on the process.

<https://www.schengenvisainfo.com/who-needs-schengen-visa/>

Rental cars are available at the airport through Hertz and National. Based on the size of the lot they don't generally have a lot of cars, so sharing and carpooling will be encouraged. If there is a lot of demand they may be able to bring more cars in as well. The rental car companies have limited hours and may not always be open when a commercial flight lands, depending on the arrival time. Taxis are available, and a bus route runs from the airport into town, but only before and after scheduled flights.

Kiruna Airport and Arena Arctica

Kiruna Airport (ESNQ) has an 8200 ft runway (03 and 21). There is no adjacent taxiway, so access to/from the main ramp area is done via taxi on the runway itself. There are turnouts available on either end. Due to the surrounding terrain there are also climb gradients during IMC conditions that may impact fuel loading and flight duration during CAESAR. Commercial traffic is light (2-3 operations per day) and private flights are also rare. The Swedish military will be using the airfield and hangar for training during the first few weeks of CAESAR, so there will be more traffic than usual requiring some coordination. The tower at ESNQ is no longer staffed, and all local ATC and ground movements are controlled from Stockholm.

Arena Arctica is the hangar where the C-130 will be housed. It is a very large, heated hangar on the southwest part of the airfield. Ground power is available for the aircraft to any point in the hangar through wall receptacles and long cords. Space is available to store the sea containers and other shipments inside. Good lighting is provided on the ramp for operations during the dark. Arena Arctica staff will be on hand to tow the aircraft when needed. CAESAR will happen during winter. Airport staff do their best to keep the runway clear during snowy periods. A mixture of hot water and sand is used to provide traction on the runway and ramp areas when needed. Deicing is also available, though with the sensitive instrumentation on board with inlets and optics this is likely not a good option and will limit operations to non-precipitating days when the temperature is below freezing.



Google Earth view of ESNQ.



Zoomed in view of ESNQ showing the location of the main terminal and Arena Arctica.



The front of the Arena Arctica hangar from the ramp.



Interior of the Arena Arctica hangar.

Around the outside of the main space are conference rooms and small offices. The CAESAR project will have access to one conference room for an Operations Center (more details below) as well as at least one lab for instrument work or a small meeting space. A small kitchen area is also available for participants to store and heat up food.

Car parking is available behind the hangar, outside of the airport fence. Participants will be given access to two gates near this parking area and to the various doors on the hangar. Each person will need to fill out a request form, take a short training, and pass a quiz in order to be given an access badge. This will be organized 2-3 months in advance of the project and more details will be provided at that time.



View of the back of the hangar from the parking area. The short posts in the foreground are receptacles to plug in engine block heaters during cold weather.

Lodging

A block of rooms is being organized for CAESAR participants at the Scandic Kiruna, which is on the east side of the city, in the new area, and only about 5 minutes from the airport. The cost will be 199 SEK (around \$200 USD) per night. The hotel is modern with a restaurant, lounge, gym, and sauna. Parking, WiFi (measured at 49.5 Mbps down and 49.4 Mbps up), and breakfast are included. The rooms are somewhat small by US standards (~200 ft²) but average for the area and do not contain a refrigerator or microwave. Laundry facilities are not currently available at this hotel. RAF will be looking into options for laundry services or facilities for project participants. More information on the hotel can be found at: <https://www.scandichotels.com/kiruna>.

Wintertime is a popular season for tourism in Kiruna because of the outdoor activities available. Therefore, knowing the number of rooms needed and getting them reserved early will be important. RAF will be handling the room reservations and tracking and will be asking for personnel schedules in order to provide accurate information to the hotel. Details on payment will be provided when the contract is in place.

There are two other hotels which are potential options if there are late additions to the project participant list and the Scandic does not have space. They are the [Best Western](#) and [Camp](#)

[Ripan](#). They are both on the western side of the city (~15 minutes from the airport) and have limited space available, but could be a temporary option.



Exterior of the Scandic Kiruna



Scandic Kiruna lobby and breakfast area.



A standard room at Scandic Kiruna.

Operations Center

As mentioned above, the CAESAR Operations Center will be housed at Arena Arctica. RAF has reserved a conference room that should easily accommodate the team for forecasting, flight planning, flight following, and data processing. WiFi is available and was measured at 27.5 Mbps down and 25.5 Mbps up. This is with a standard 100 Mbps connection to the hangar, which will be upgraded to 500 Mbps for CAESAR. EOL will provide networking equipment along with a printer and any necessary A/V equipment. Data sharing is likely to happen via a cloud distribution network, but EOL may also provide servers if deemed necessary.

In Sweden the power plug sockets are Type F. The standard voltage is 230 V and the frequency is 50 Hz. EOL will provide converters and US style power strips in the Operations Center, but adapters and converters will be required in hotel rooms and other locations.



Operations Center room at Arena Arctica.



Type F plug and receptacle.

Shipping

RAF will be shipping 3-4 sea containers to Kiruna in the months before the project. The exact shipping date is unknown but is thought to be by November. These containers will contain aircraft and RAF instrumentation support equipment, but instrument teams will be welcome to include items as well on a space available basis as long as the user can be without it for a few months before and after the project. Teams who require consumables, specifically cylinders, should plan ahead and have them shipped in the containers. Certain gasses may be difficult to find, and other countries often have different connections than what is available in the US.

All items that are shipped over in the containers must return via that method. Additional items also cannot be added to the containers in Sweden for return shipment to the US.

Any air shipments of last minute items or parts during the project will be the responsibility of the instrument team. UCAR Logistics will be working with a shipping company on the containers and RAF air shipments to get instructions and potentially streamline the process, but they will not be able to ship anything for anyone outside NCAR.

Weather and Daylight

Kiruna will be dark and cold at the beginning of the project with daylight and average temperatures increasing throughout. The northern latitude of Kiruna means that the day lengths vary quite a bit throughout the year. Daylight will be increasing around 8 minutes per day during the project. On February 20 there will be around 8.5 hours of daylight (sunrise and sunset at 0737 and 1609, respectively), while on April 10 there will be about 15 hours of daylight (sunrise and sunset at 0508 and 2014, respectively). Temperatures below freezing can be expected most of the time with lows dropping below 0 °F at times. Typical snowfall is 4-6" during each month of the project (February, March, and April). Warm winter gear will be a must.

Kiruna

Kiruna itself has almost all of the amenities one would expect in a city of its size. There is a large grocery store, a couple of sporting goods stores with winter weather gear, and a fair number of restaurants. With the moving of the city due to mine operations there is a lot of new development in the area near the Scandic. There is a shopping center with a smaller grocery

store, some restaurants, a pharmacy, and other shops. Even more stores will be open by the time the project begins, providing additional options for participants.

The currency is Swedish Krona (SEK) and the exchange rate in May 2023 is approximately 10 SEK per US Dollar. All vendors take credit cards and using bills or coins is rare. No one on the site survey team withdrew any Krona during either visit. If your credit card charges an international transaction fee please consider applying for one that waives them. Most of the large bank cards (e.g. Chase, US Bank, etc.) do not charge fees.

A hospital is located in the old city area. Please check with your health insurance for any questions you may have about receiving care if needed. No special vaccinations are required to enter Sweden. As of the site visit (April 2023) there are no COVID restrictions or rules for entering or leaving the country for US citizens. If this changes project participants will be notified.

Activities in Kiruna are geared towards winter and include Aurora viewing tours, dog sled tours, snowmobiling, cross country skiing, and the Ice Hotel (about 20 minutes outside Kiruna).