



The Power of We™

# "Let's Fly" Series Montreal to Frankfurt

## Data Science Technology

## Python Program



```

FlightPath: updated flight path length= 3221.49 nautics

FlightPath: fix list= ['climb-ramp-pt-116-9299.84-meters', 'TAMKO', 'MATOR', 'DICEN',
'CHARLEVOIX', 'RIVIEREDULOUP', 'LOMSI', 'RESNO', 'NETKI', 'NIBOG', 'BELFAST', 'DUFFY',
'RINGA', 'SLYDA', 'ISLEOFMAN', 'KELLY', 'PENIL', 'ASNIP', 'MANCHESTER', 'DISAL', 'NAPEX',
'DOLAS', 'ENITO', 'BUKUT', 'EVELI', 'BASNO', 'PAMPUS', 'LUNIX', 'EDUPO', 'NAPRO',
'AMOSU', 'MISGO', 'COLA', 'ROLIS', 'turn-pt-78-319.64-degrees']

===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 45.40 degrees to 1.92 degrees - turn step is= -3.00 degrees
FlightPath: distance to last fix= 3196.72296341 nautics
FlightPath: still to fly= 3215.84090815 nautics
TurnLeg: tas= 183.27 knots - radius of turn= 3381.66 meters - radius of turn= 1.83 nautics
TurnLeg: initial heading= 45.40 degrees
TurnLeg: final heading= -0.50 degrees
===== end of turn leg =====

FlightPath: end of turn orientation= 359.50 degrees
FlightPath: difference= 52.13 degrees
FlightPath: anticipated turn start from end point= 7898.15 meters
FlightPath: Envisage anticipated Fly By turn !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

===== great circle =====
FlightPath: distance to last fix= 3195.38883782 nautics
FlightPath: still to fly= 3214.37785611 nautics
GreatCircleRoute: initial way-point= turn-pt-28--0.50-degrees - latitude= 45.76 degrees -
longitude= -73.91 degrees - altitudeMSL= 1698.11 meters

BadaAircraft =====

BadaAircraft: entering climb configuration - distance flown 23682.47 meters - distance
flown 12.79 nautics
BadaAircraft: alt= 3043.94 meters alt= 9986.56 feet
BadaAircraft: tas= 121.68 m/s - tas= 236.53 knots - cas= 105.22 m/s - cas= 204.52 knots -
mach= 0.37

```



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```
BadaAircraft: real time = 273.00 seconds - 4.00 minutes 33.00 seconds

BadaAircraft =====

GreatCircleRoute: final way-point= Anticipated-Turn-TAMKO - latitude= 45.98 degrees -
longitude= -73.91 degrees - altitudeMSL= 4712.94 meters
===== end of great circle =====

FlightPath: still to fly= 5928662.25 meters - still to fly= 3201.22 nautics
FlightPath: passing waypoint: Anticipated-Turn-TAMKO - alt= 4712.94 meters - alt=
15462.21 feet - distance= 20.27 nautics - real time = 377.00 seconds - 6.00 minutes 17.00
seconds

===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 0.35 degrees to 46.57 degrees - turn step is= 3.00 degrees
FlightPath: distance to last fix= 3180.79697224 nautics
FlightPath: still to fly= 3201.22151288 nautics
TurnLeg: tas= 278.80 knots - radius of turn= 7825.74 meters - radius of turn= 4.23 nautics
TurnLeg: initial heading= 0.35 degrees
TurnLeg: final heading= 49.83 degrees
===== end of turn leg =====

FlightPath: end of turn orientation= 49.83 degrees
FlightPath: difference= 8.62 degrees
FlightPath: anticipated turn start from end point= 116354.27 meters

===== great circle =====
FlightPath: distance to last fix= 3177.52071927 nautics
FlightPath: still to fly= 3197.60946894 nautics
GreatCircleRoute: initial way-point= turn-pt-46-49.83-degrees - latitude= 46.03 degrees -
longitude= -73.87 degrees - altitudeMSL= 5432.11 meters
GreatCircleRoute: final way-point= MATOR - latitude= 46.35 degrees - longitude= -73.34
degrees - altitudeMSL= 9454.89 meters
===== end of great circle =====
```



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```
FlightPath: still to fly= 5867373.44 meters - still to fly= 3168.13 nautics
FlightPath: passing waypoint: MATOR - alt= 9454.89 meters - alt= 31019.60 feet - distance=
53.36 nautics - real time = 737.00 seconds - 12.00 minutes 17.00 seconds

===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 49.45 degrees to 57.68 degrees - turn step is= 3.00 degrees
FlightPath: distance to last fix= 3148.0416264 nautics
FlightPath: still to fly= 3168.1282066 nautics
TurnLeg: tas= 373.53 knots - radius of turn= 14047.52 meters - radius of turn= 7.59 nautics
TurnLeg: initial heading= 49.45 degrees
TurnLeg: final heading= 58.08 degrees
===== end of turn leg =====

FlightPath: end of turn orientation= 58.08 degrees
FlightPath: difference= -0.17 degrees
FlightPath: anticipated turn start from end point= 9547734.67 meters

===== great circle =====
FlightPath: distance to last fix= 3146.90193792 nautics
FlightPath: still to fly= 3166.98739889 nautics
GreatCircleRoute: initial way-point= turn-pt-11-58.08-degrees - latitude= 46.36 degrees -
longitude= -73.32 degrees - altitudeMSL= 9560.69 meters
BadaAircraft: cruise level reached= 11880.74 meters = 38978.34 feet

BadaAircraft =====

BadaAircraft: entering cruise configuration - distance flown 175656.19 meters - distance
flown 94.85 nautics
BadaAircraft: alt= 11876.98 meters alt= 38965.99 feet
BadaAircraft: tas= 212.76 m/s - tas= 413.57 knots - cas= 113.79 m/s - cas= 221.19 knots -
mach= 0.72
BadaAircraft: real time = 1114.00 seconds - 18.00 minutes 34.00 seconds

BadaAircraft =====
```



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```
GreatCircleRoute: final way-point= DICEN - latitude= 46.80 degrees - longitude= -72.29
degrees - altitudeMSL= 11880.74 meters
===== end of great circle =====

FlightPath: still to fly= 5772740.06 meters - still to fly= 3117.03 nautics
FlightPath: passing waypoint: DICEN - alt= 11880.74 meters - alt= 38978.34 feet - distance=
104.46 nautics - real time = 1194.00 seconds - 19.00 minutes 54.00 seconds

===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 58.52 degrees to 57.61 degrees - turn step is= -3.00 degrees
FlightPath: distance to last fix= 3096.96330823 nautics
FlightPath: still to fly= 3117.03026685 nautics
TurnLeg: tas= 444.23 knots - radius of turn= 19869.23 meters - radius of turn= 10.73 nautics
TurnLeg: initial heading= 58.52 degrees
TurnLeg: final heading= 57.20 degrees
===== end of turn leg =====

FlightPath: end of turn orientation= 57.20 degrees
FlightPath: difference= 16.92 degrees
FlightPath: anticipated turn start from end point= 134013.19 meters

===== great circle =====
FlightPath: distance to last fix= 3096.71620904 nautics
FlightPath: still to fly= 3116.80166422 nautics
GreatCircleRoute: initial way-point= turn-pt-2-57.20-degrees - latitude= 46.80 degrees -
longitude= -72.28 degrees - altitudeMSL= 11880.74 meters
GreatCircleRoute: final way-point= CHARLEVOIX - latitude= 47.63 degrees - longitude=
-70.30 degrees - altitudeMSL= 11880.74 meters
===== end of great circle =====

FlightPath: still to fly= 5596124.08 meters - still to fly= 3021.67 nautics
```



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FlightPath: passing waypoint: CHARLEVOIX - alt= 11880.74 meters - alt= 38978.34 feet - distance= 199.83 nautics - real time = 1918.00 seconds - 31.00 minutes 58.00 seconds

===== one Turn Leg for each fix in the list =====

TurnLeg: turn from= 59.05 degrees to 74.53 degrees - turn step is= 3.00 degrees

FlightPath: distance to last fix= 3002.71703782 nautics

FlightPath: still to fly= 3021.665265 nautics

TurnLeg: tas= 476.27 knots - radius of turn= 22838.07 meters - radius of turn= 12.33 nautics

TurnLeg: initial heading= 59.05 degrees

TurnLeg: final heading= 75.64 degrees

===== end of turn leg =====

FlightPath: end of turn orientation= 75.64 degrees

FlightPath: difference= -23.54 degrees

FlightPath: anticipated turn start from end point= 109591.04 meters

===== great circle =====

FlightPath: distance to last fix= 2999.18660712 nautics

FlightPath: still to fly= 3017.22060792 nautics

GreatCircleRoute: initial way-point= turn-pt-27-75.64-degrees - latitude= 47.65 degrees - longitude= -70.24 degrees - altitudeMSL= 11880.74 meters

GreatCircleRoute: final way-point= RIVIEREDULOUP - latitude= 47.76 degrees - longitude= -69.58 degrees - altitudeMSL= 11880.74 meters

===== end of great circle =====

FlightPath: still to fly= 5536439.69 meters - still to fly= 2989.44 nautics

FlightPath: passing waypoint: RIVIEREDULOUP - alt= 11880.74 meters - alt= 38978.34 feet - distance= 232.05 nautics - real time = 2155.00 seconds - 35.00 minutes 55.00 seconds

===== one Turn Leg for each fix in the list =====

TurnLeg: turn from= 75.96 degrees to 51.95 degrees - turn step is= -3.00 degrees

FlightPath: distance to last fix= 2971.91592191 nautics



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```
FlightPath: still to fly= 2989.43827532 nautics
TurnLeg: tas= 476.27 knots - radius of turn= 22838.07 meters - radius of turn= 12.33 nautics
TurnLeg: initial heading= 75.96 degrees
TurnLeg: final heading= 51.38 degrees
===== end of turn leg =====

FlightPath: end of turn orientation= 51.38 degrees
FlightPath: difference= 16.66 degrees
FlightPath: anticipated turn start from end point= 155982.71 meters

===== great circle =====
FlightPath: distance to last fix= 2966.76875091 nautics
FlightPath: still to fly= 2983.89933794 nautics
GreatCircleRoute: initial way-point= turn-pt-40-51.38-degrees - latitude= 47.80 degrees -
longitude= -69.47 degrees - altitudeMSL= 11880.74 meters
GreatCircleRoute: final way-point= LOMSI - latitude= 53.11 degrees - longitude= -56.76
degrees - altitudeMSL= 11880.74 meters
===== end of great circle =====

FlightPath: still to fly= 4450571.37 meters - still to fly= 2403.12 nautics
FlightPath: passing waypoint: LOMSI - alt= 11880.74 meters - alt= 38978.34 feet - distance=
818.38 nautics - real time = 6585.00 seconds - 1.00 hours 49.00 minutes 45.00 seconds

===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 61.74 degrees to 68.60 degrees - turn step is= 3.00 degrees
FlightPath: distance to last fix= 2387.07464266 nautics
FlightPath: still to fly= 2403.11628967 nautics
TurnLeg: tas= 476.27 knots - radius of turn= 22838.07 meters - radius of turn= 12.33 nautics
TurnLeg: initial heading= 61.74 degrees
TurnLeg: final heading= 69.12 degrees
===== end of turn leg =====
```



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```
FlightPath: end of turn orientation= 69.12 degrees
FlightPath: difference= 20.96 degrees
FlightPath: anticipated turn start from end point= 123463.41 meters

===== great circle =====
FlightPath: distance to last fix= 2385.49015415 nautics
FlightPath: still to fly= 2400.7043729 nautics
GreatCircleRoute: initial way-point= turn-pt-12-69.12-degrees - latitude= 53.11 degrees -
longitude= -56.74 degrees - altitudeMSL= 11880.74 meters
GreatCircleRoute: final way-point= RESNO - latitude= 55.00 degrees - longitude= -15.00
degrees - altitudeMSL= 11880.74 meters
===== end of great circle =====

FlightPath: still to fly= 1750953.64 meters - still to fly= 945.44 nautics
FlightPath: passing waypoint: RESNO - alt= 11880.74 meters - alt= 38978.34 feet - distance=
2276.05 nautics - real time = 17597.00 seconds - 4.00 hours 53.00 minutes 17.00 seconds

===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 102.92 degrees to 89.59 degrees - turn step is= -3.00 degrees
FlightPath: distance to last fix= 930.303423776 nautics
FlightPath: still to fly= 945.439331668 nautics
TurnLeg: tas= 476.27 knots - radius of turn= 22838.07 meters - radius of turn= 12.33 nautics
TurnLeg: initial heading= 102.92 degrees
TurnLeg: final heading= 88.78 degrees
===== end of turn leg =====

FlightPath: end of turn orientation= 88.78 degrees
FlightPath: difference= -0.73 degrees
FlightPath: anticipated turn start from end point= 3579873.29 meters

===== great circle =====
FlightPath: distance to last fix= 927.286089659 nautics
```



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```
FlightPath: still to fly= 942.474803517 nautics
GreatCircleRoute: initial way-point= turn-pt-23-88.78-degrees - latitude= 55.00 degrees -
longitude= -14.91 degrees - altitudeMSL= 11880.74 meters
GreatCircleRoute: final way-point= NETKI - latitude= 55.00 degrees - longitude= -13.99
degrees - altitudeMSL= 11880.74 meters
===== end of great circle =====

FlightPath: still to fly= 1686660.05 meters - still to fly= 910.72 nautics
FlightPath: passing waypoint: NETKI - alt= 11880.74 meters - alt= 38978.34 feet - distance=
2310.77 nautics - real time = 17860.00 seconds - 4.00 hours 57.00 minutes 40.00 seconds

===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 89.82 degrees to 88.36 degrees - turn step is= -3.00 degrees
FlightPath: distance to last fix= 895.827358467 nautics
FlightPath: still to fly= 910.723566254 nautics
TurnLeg: tas= 476.27 knots - radius of turn= 22838.07 meters - radius of turn= 12.33 nautics
TurnLeg: initial heading= 89.82 degrees
TurnLeg: final heading= 87.97 degrees
===== end of turn leg =====

FlightPath: end of turn orientation= 87.97 degrees
FlightPath: difference= 8.95 degrees
FlightPath: anticipated turn start from end point= 291665.61 meters

===== great circle =====
FlightPath: distance to last fix= 895.430486356 nautics
FlightPath: still to fly= 910.298748332 nautics
GreatCircleRoute: initial way-point= turn-pt-3-87.97-degrees - latitude= 55.00 degrees -
longitude= -13.99 degrees - altitudeMSL= 11880.74 meters
GreatCircleRoute: final way-point= NIBOG - latitude= 55.00 degrees - longitude= -10.00
degrees - altitudeMSL= 11880.74 meters
===== end of great circle =====
```





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```
FlightPath: still to fly= 1431059.02 meters - still to fly= 772.71 nautics
FlightPath: passing waypoint: NIBOG - alt= 11880.74 meters - alt= 38978.34 feet - distance=
2448.78 nautics - real time = 18903.00 seconds - 5.00 hours 15.00 minutes 3.00 seconds

===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 91.61 degrees to 97.32 degrees - turn step is= 3.00 degrees
FlightPath: distance to last fix= 757.940717005 nautics
FlightPath: still to fly= 772.710053525 nautics
TurnLeg: tas= 476.27 knots - radius of turn= 22838.07 meters - radius of turn= 12.33 nautics
TurnLeg: initial heading= 91.61 degrees
TurnLeg: final heading= 97.76 degrees
===== end of turn leg =====

FlightPath: end of turn orientation= 97.76 degrees
FlightPath: difference= 26.87 degrees
FlightPath: anticipated turn start from end point= 95614.17 meters

===== great circle =====
FlightPath: distance to last fix= 756.61949316 nautics
FlightPath: still to fly= 771.485990286 nautics
GreatCircleRoute: initial way-point= turn-pt-10-97.76-degrees - latitude= 55.00 degrees -
longitude= -9.96 degrees - altitudeMSL= 11880.74 meters
GreatCircleRoute: final way-point= BELFAST - latitude= 54.66 degrees - longitude= -6.22
degrees - altitudeMSL= 11880.74 meters
===== end of great circle =====

FlightPath: still to fly= 1186228.48 meters - still to fly= 640.51 nautics
FlightPath: passing waypoint: BELFAST - alt= 11880.74 meters - alt= 38978.34 feet -
distance= 2580.98 nautics - real time = 19903.00 seconds - 5.00 hours 31.00 minutes 43.00
seconds
```



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```
===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 100.40 degrees to 124.25 degrees - turn step is= 3.00 degrees
FlightPath: distance to last fix= 625.850639188 nautics
FlightPath: still to fly= 640.512136575 nautics
TurnLeg: tas= 476.27 knots - radius of turn= 13123.18 meters - radius of turn= 7.09 nautics
TurnLeg: initial heading= 100.40 degrees
TurnLeg: final heading= 127.15 degrees
===== end of turn leg =====

FlightPath: end of turn orientation= 127.15 degrees
FlightPath: difference= -2.42 degrees
FlightPath: anticipated turn start from end point= 1081294.32 meters

===== great circle =====
FlightPath: distance to last fix= 622.635506048 nautics
FlightPath: still to fly= 637.264248057 nautics
GreatCircleRoute: initial way-point= turn-pt-25-127.15-degrees - latitude= 54.64 degrees -
longitude= -6.14 degrees - altitudeMSL= 11880.74 meters
GreatCircleRoute: final way-point= DUFFY - latitude= 54.51 degrees - longitude= -5.84
degrees - altitudeMSL= 11880.74 meters
===== end of great circle =====

FlightPath: still to fly= 1155712.02 meters - still to fly= 624.03 nautics
FlightPath: passing waypoint: DUFFY - alt= 11880.74 meters - alt= 38978.34 feet - distance=
2597.46 nautics - real time = 20028.00 seconds - 5.00 hours 33.00 minutes 48.00 seconds

===== one Turn Leg for each fix in the list =====
TurnLeg: turn from= 127.17 degrees to 124.53 degrees - turn step is= -3.00 degrees
FlightPath: distance to last fix= 610.271731257 nautics
FlightPath: still to fly= 624.034565864 nautics
TurnLeg: tas= 476.27 knots - radius of turn= 13123.18 meters - radius of turn= 7.09 nautics
TurnLeg: initial heading= 127.17 degree
TurnLeg: final heading= 123.96 degrees
===== end of turn leg =====
```