

# Run to failure experiment C3 - digital twin informs true system, true system not allowed to explore

In this work remaining useful life (RUL) refers to the total flight time possible for a single mission. Hypothesis here is that the true system should never fail now. But I see that true system will select an explored trajectory if the digital twin passes it, this might be risky, we need to consider dynamic risk. This is in contract to some of our previous work where RUL referred to the entire life of the UAV across multiple missions. This time the digital twin is simulated multiple times for a distribution.

## Simulation Steps

The first step is to load the models, provide an initial RUL estimate (using manufacturers information on the battery is a good starting place), and load some workspace variables. 1D polynomial fitting is used to approximate the degradation rate, and thereby predict the mean of the future degradation value distribution. These predicted values are then passed to a digital twin, which is simulated multiple times to generate a monte carlo distribution of variables tracked such as ending state of charge and voltage and mission outcome. The RUL is updated based on the result of the digital twin simulation, and then the new RUL is used by the real system for trajectory selection. The steps are as follows:

- 1.

## Uncertainty Quantification

## Trajectories

## load main workspace

```
end_sim = 0;
fail_count = 0;
low_soc_count = 0;
pos_err_count = 0;

addpath(genpath(pwd));
load_db_params;
conn = database(datasource_name, user_name, password);

% load UAV airframe
uav_sern = 'X001';
octomodel = get_airframe(conn, uav_sern);

% load battery
```

```

battery_sern = 'B001';
battery = get_battery(conn, battery_sern);
batterytwin = get_battery(conn, battery_sern);

% load motors
[Motor1, Motor2, Motor3, Motor4, Motor5, Motor6, Motor7, Motor8] = get_motors(conn, octomodel.i
[Motortwin1, Motortwin2, Motortwin3, Motortwin4, Motortwin5, Motortwin6, Motortwin7, Motortwin8

% initial rul estimate, used as baseline in rul updates where the minimum
% value is taken to ensure rul_hat never exceeds this value
rul_init = 18.0;
rul_hat = rul_init;

% minimum rul
rul_threshold = 10.0;

% load base directory
load_base_workspace;

```

## Initialize some variables

```

% for poly fitting
lookback = 6;

% how far into the future to look
horizon = 2;

% number of missions (can be oversized)
n_missions = 250;

% keep track of delta over time
% number of missions, 3 degradation parameters, 2 coefficients to save
% (slope & intercept)
polys = zeros(n_missions, 3, 2);

% keep track of degradation parameter values for poly fitting
q_deg = zeros(n_missions, 1);
r_deg = zeros(n_missions, 1);
m_deg = zeros(n_missions, 1);

% variance gets tighter over time, a pseudo-hack...
r_var_vals = [.001:-.00001:.0001];
q_var_vals = [.9:-.01:.2];
m_var_vals = [.02:-.00025:.0025];

% keep track of rul
ruls = zeros(n_missions, 1);

```

## Main Loop

```

% load initial trajectory, catch edge case that the first trajectory
% explores rather than exploits

```

```

load_trajectory;
while trajectory.path_time > rul_init
    load_trajectory;
end

for i = 1:n_missions
    if i < 20 && i >= 11
        lookback = 8;
        horizon = 3;
    elseif i >= 21 && i < 30
        lookback = 10;
        horizon = 4;
    elseif i >= 31
        lookback = 12;
        horizon = 6;
    end

    ruls(i) = rul_hat;

    % I don't think this should ever execute now that the digital twin is
    % selecting trajectories for the true system
    if end_sim == 1
        disp("[INFO] no more valid trajectories. ending simulation.")
        break;
    end
    if trajectory.path_time > rul_hat
        load_trajectory;
        while trajectory.path_time > rul_init
            load_trajectory;
        end
        %fprintf("[INFO] TrueSystem selecting trajectory: <%d> with path_time: %.2f to explore
    else
        fprintf("[INFO] TrueSystem selecting trajectory: <%d> with path_time: %.2f that meets c
    end
    sys = "TrueSystem";
    octomodel.sampletime = true_sample_rate;
    fprintf('[INFO] simulating true system on i: %d\n', i)
    %tic
    sim('truesystem.slx');
    %toc

```

## update degradation parameters for saving

- assign values from the current run to the arrays for saving

```

q_deg(i) = battery.Q;
r_deg(i) = battery.R0;
m_deg(i) = Motor2.Req;

```

## update variance

```

fprintf('[INFO] updating degradation parameter variance on i: %d\n', i)
if i <= length(r_var_vals)

```

```

        r_var = r_var_vals(i);
    else
        r_var = .0001;
    end
    if i <= length(q_var_vals)
        q_var = q_var_vals(i);
    else
        q_var = .25;
    end
    if i <= length(m_var_vals)
        m_var = m_var_vals(i);
    else
        m_var = .005;
    end
end

```

## sample the degradation parameters and update

```

fprintf('[INFO] updating degradation parameter values via random sampling on i: %d\n', i)
battery.R0 = max(abs(normrnd(rdeg(i), r_var)), .0001);
battery.Q = min(abs(normrnd(qdeg(i), q_var)), 15.5);
Motor2.Reg = max(abs(normrnd(mdeg(i), m_var)), .001);

```

## write telemetry data to database

```

distance = calculatedistance([pos_actual.Data(:,1) pos_actual.Data(:,2)]);
mission_id = table2array(select(conn, 'select id from mission_tb mt order by id desc limit 1'));
if isempty(mission_id)
    mission_id = 1;
else
    mission_id = mission_id + 1;
end
start = table2array(select(conn, 'select mt.dt_stop from mission_tb mt order by dt_stop desc limit 1'));
if isempty(start)
    start = datetime(now, 'ConvertFrom', 'datenum');
end
start = datetime(start, 'InputFormat', 'yyyy-MM-dd HH:mm:ss');
start = dateshift(start, 'start', 'second');
start = start + hours(1);
stop = start + seconds(flight_time.Data(end, 1)*60);

fprintf("[INFO] i: %d\tmission_id: %d\ttrul_hat: %.2f\tflight_time: %.2f\tdistance: %.2f\tR0: %.2f\tQ: %.2f\tReg: %.2f\n", i, mission_id, trul_hat, flight_time, distance, R0, Q, Reg);

write_mission_data;
write_battery_data;
write_flight_data;

if any(stop_code.Data(:,1)) == 1 && ~any(stop_code.Data(:,3)) == 1
    fprintf('[WARN] true system low soc threshold exceeded on i: %d\tmission_id: %d\n', i, mission_id);
    %break;
end

if any(stop_code.Data(:,2)) == 1
    fprintf('[WARN] true system position error threshold exceeded on i: %d\tmission_id: %d\n', i, mission_id);
    %break;
end

```

```

end

if any(stop_code.Data(:,3)) == 1
    fprintf('[INFO] success on i: %d\tmission_id: %d\n', i, mission_id)
end

clear('trajectory', 'battery_actual', 'battery_observed', 'ctrl_err', 'current', 'current_r

```

## define placeholder variables

```

twin_ctr = 1;
twin_count = 4;
times = zeros(1, twin_count);
vs = zeros(1, twin_count);
socs = zeros(1, twin_count);
r0s = zeros(1, twin_count);
qs = zeros(1, twin_count);
ms = zeros(1, twin_count);
dist = zeros(1, twin_count);
errs = zeros(1, twin_count);
degs = zeros(3, twin_count);
codes = zeros(3, twin_count);

```

## Update twin degradation parameters

```

if i > lookback
    x = double(((i - (lookback-1)):1:i)');
    r_poly = polyfit(x, smoothdata(r_deg(x), 'rlowess', 5), 1);
    q_poly = polyfit(x, smoothdata(q_deg(x), 'rlowess', 5), 1);
    m_poly = polyfit(x, smoothdata(m_deg(x), 'rlowess', 5), 1);

    polys(i, 1, :) = r_poly;
    polys(i, 2, :) = q_poly;
    polys(i, 3, :) = m_poly;

    r_mu = polyval(r_poly, i + horizon);
    q_mu = polyval(q_poly, i + horizon);
    m_mu = polyval(m_poly, i + horizon);
    fprintf('[INFO] forecasting degradation values: r_mu: %.6f\tq_mu: %.6f\tm_mu: %.6f', r_mu, q_mu, m_mu);
    batterytwin.R0 = max(abs(normrnd(r_mu, r_var)), .0001);
    batterytwin.Q = min(abs(normrnd(q_mu, q_var)), 15.5);
    Motortwin2.Req = max(abs(normrnd(m_mu, m_var)), .001);
else
    batterytwin.R0 = max(abs(normrnd(rdeg(i), r_var)), .0001);
    batterytwin.Q = min(abs(normrnd(qdeg(i), q_var)), 15.5);
    Motortwin2.Req = max(abs(normrnd(mdeg(i), m_var)), .001);
end
fprintf("[INFO] digital twin degradation parameters: %.4f\t%.4f\t%.4f", batterytwin.R0, batterytwin.Q, Motortwin2.Req);
write_degradation_data;

```

## now simulate digital twin

```

updated = true;
while updated

```

```

load_trajectory;
if trajectory.path_time > rul_hat
    fprintf("[INFO] DigitalTwin selecting trajectory: <id> with path_time: %.2f to expl
else
    fprintf("[INFO] DigitalTwin selecting trajectory: <id> with path_time: %.2f that me
end
sys = "DigitalTwin";
octomodel.sampletime = twin_sample_rate;
for twin_ctr=1:twin_count
    fprintf('[INFO] simulating digital twin on i %d, mission_id: %d\n', i, mission_id)
    out = sim('digitaltwin1c.slx');
    %           get the output from each parallel worker
    times(twin_ctr) = flight_time.Data(end);
    vs(twin_ctr) = battery_actual.Data(end, 1);
    socs(twin_ctr) = battery_actual.Data(end, 2);
    r0s(twin_ctr) = battery_actual.Data(end, 3);
    qs(twin_ctr) = battery_actual.Data(end, 6);
    ms(twin_ctr) = motors.Data(end, 1);
    errs(twin_ctr) = mean(euclidean_pos_err);
    dist(twin_ctr) = calculatedistance([pos_actual.Data(:,1) pos_actual.Data(:,2)]);
    degs(:, twin_ctr) = [batterytwin.R0 batterytwin.Q Motortwin2.Req]';
    codes(:, twin_ctr) = [any(stop_code.Data(:,1)); any(stop_code.Data(:,2)); any(stop

```

## write digital twin parameters to db

```
write_twin_params_data;
```

## resample the degradation parameters for the next digital twin simulation

```

if twin_count > 1 && twin_ctr < twin_count
    fprintf('[INFO] resampling for twin run # %d', twin_ctr + 1);
    if i > lookback
        batterytwin.R0 = normrnd(r_mu, r_var);
        batterytwin.Q = normrnd(q_mu, q_var);
        Motortwin2.Req = normrnd(m_mu, m_var);
    else
        batterytwin.R0 = max(abs(normrnd(rdeg(i), r_var)), .00075);
        batterytwin.Q = min(abs(normrnd(qdeg(i), q_var)), 15.5);
        Motortwin2.Req = max(abs(normrnd(mdeg(i), m_var)), .001);
    end
end
fprintf("[INFO] digital twin degradation parameters: %.4f\t%.4f\t%.4f", batterytwin
end

low_soc = sum(codes(1,:) == 1);
pos_err = sum(codes(2,:) == 1);
success = sum(codes(3,:) == 1);
fprintf("[INFO] DigitalTwin mean parameter values: R0 = %.5f\t Q = %.2f\t Req = %.5f\n\

```

## update rul

```

if low_soc > 1
    fprintf('[WARN] DigitalTwin low soc threshold exceeded on i: %d\tmission_id: %d\n',
    temp = mean(times(:)) - 1;

```



```

[INFO] digital twin degradation parameters: 0.0025 15.5000 0.2130
[INFO] simulating digital twin on i 1, mission_id: 831
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0018 15.5000 0.2469
[INFO] simulating digital twin on i 1, mission_id: 831
[INFO] digital twin degradation parameters: 0.0018 15.5000 0.2469
[INFO] DigitalTwin mean parameter values: R0 = 0.00236 Q = 15.50 Req = 0.24024
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 1 mission_id: 831
trajectory <2> selected for TrueSystem
[INFO] new RUL update is available, 18.93 replaces 18.00
[INFO] simulating true system on i: 2
[INFO] updating degradation parameter variance on i: 2
[INFO] updating degradation parameter values via random sampling on i: 2
[INFO] i: 2 mission_id: 832 rul_hat: 18.93 flight_time: 17.63 distance: 1283.69 R0: 0.00081 Q: 15.25 Req: 0.22203
[INFO] success on i: 2 mission_id: 832
[INFO] digital twin degradation parameters: 0.0020 13.9681 0.2165
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 that meets constraint: path_time < 18.93
[INFO] simulating digital twin on i 2, mission_id: 832
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0025 15.2784 0.2227
[INFO] simulating digital twin on i 2, mission_id: 832
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0025 13.4657 0.2356
[INFO] simulating digital twin on i 2, mission_id: 832
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0009 15.2731 0.2438
[INFO] simulating digital twin on i 2, mission_id: 832
[INFO] digital twin degradation parameters: 0.0009 15.2731 0.2438
[INFO] DigitalTwin mean parameter values: R0 = 0.00196 Q = 14.50 Req = 0.22961
stop code counts: low_soc: 2 pos_err: 0 success: 2
[WARN] DigitalTwin low soc threshold exceeded on i: 2 mission_id: 832
[INFO] updating RUL from 18.93 to 17.58
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 2, mission_id: 832
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0009 15.5000 0.2592
[INFO] simulating digital twin on i 2, mission_id: 832
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0022 14.2203 0.2391
[INFO] simulating digital twin on i 2, mission_id: 832
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0008 13.9980 0.2374
[INFO] simulating digital twin on i 2, mission_id: 832
[INFO] digital twin degradation parameters: 0.0008 13.9980 0.2374
[INFO] DigitalTwin mean parameter values: R0 = 0.00119 Q = 14.75 Req = 0.24487
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 2 mission_id: 832
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 3
[INFO] updating degradation parameter variance on i: 3
[INFO] updating degradation parameter values via random sampling on i: 3
[INFO] i: 3 mission_id: 833 rul_hat: 17.58 flight_time: 14.83 distance: 1083.16 R0: 0.00262 Q: 14.30 Req: 0.24529
[INFO] success on i: 3 mission_id: 833
[INFO] digital twin degradation parameters: 0.0009 15.5000 0.2168
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 3, mission_id: 833
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0022 15.5000 0.2397
[INFO] simulating digital twin on i 3, mission_id: 833
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0008 14.3242 0.2174
[INFO] simulating digital twin on i 3, mission_id: 833

```



```

[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0034 14.4357 0.2526
[INFO] simulating digital twin on i 3, mission_id: 833
[INFO] digital twin degradation parameters: 0.0034 14.4357 0.2526
[INFO] DigitalTwin mean parameter values: R0 = 0.00182 Q = 14.94 Req = 0.23163
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 3 mission_id: 833
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 4
[INFO] updating degradation parameter variance on i: 4
[INFO] updating degradation parameter values via random sampling on i: 4
[INFO] i: 4 mission_id: 834 rul_hat: 17.58 flight_time: 13.94 distance: 1047.64 R0: 0.00094 Q: 15.50 Req: 0.22381
[INFO] success on i: 4 mission_id: 834
[INFO] digital twin degradation parameters: 0.0002 13.7284 0.2479
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 4, mission_id: 834
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0025 15.2196 0.2423
[INFO] simulating digital twin on i 4, mission_id: 834
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0027 14.2660 0.2519
[INFO] simulating digital twin on i 4, mission_id: 834
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0019 14.7538 0.2427
[INFO] simulating digital twin on i 4, mission_id: 834
[INFO] digital twin degradation parameters: 0.0019 14.7538 0.2427
[INFO] DigitalTwin mean parameter values: R0 = 0.00184 Q = 14.49 Req = 0.24622
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 4 mission_id: 834
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 5
[INFO] updating degradation parameter variance on i: 5
[INFO] updating degradation parameter values via random sampling on i: 5
[INFO] i: 5 mission_id: 835 rul_hat: 17.58 flight_time: 14.83 distance: 1083.20 R0: 0.00010 Q: 13.97 Req: 0.24101
[INFO] success on i: 5 mission_id: 835
[INFO] digital twin degradation parameters: 0.0018 15.5000 0.2263
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 5, mission_id: 835
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0008 14.5768 0.2049
[INFO] simulating digital twin on i 5, mission_id: 835
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0019 14.1906 0.2409
[INFO] simulating digital twin on i 5, mission_id: 835
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0008 15.2153 0.2276
[INFO] simulating digital twin on i 5, mission_id: 835
[INFO] digital twin degradation parameters: 0.0008 15.2153 0.2276
[INFO] DigitalTwin mean parameter values: R0 = 0.00132 Q = 14.87 Req = 0.22495
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 5 mission_id: 835
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 6
[INFO] updating degradation parameter variance on i: 6
[INFO] updating degradation parameter values via random sampling on i: 6
[INFO] i: 6 mission_id: 836 rul_hat: 17.58 flight_time: 14.83 distance: 1083.31 R0: 0.00161 Q: 15.50 Req: 0.27160
[INFO] success on i: 6 mission_id: 836
[INFO] digital twin degradation parameters: 0.0010 13.1246 0.2238
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.58
[INFO] simulating digital twin on i 6, mission_id: 836
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0021 15.0476 0.2664

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[INFO] simulating digital twin on i 6, mission_id: 836
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0008 14.7742 0.2169
[INFO] simulating digital twin on i 6, mission_id: 836
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0039 15.5000 0.2654
[INFO] simulating digital twin on i 6, mission_id: 836
[INFO] digital twin degradation parameters: 0.0039 15.5000 0.2654
[INFO] DigitalTwin mean parameter values: R0 = 0.00192 Q = 14.61 Req = 0.24310
stop code counts: low_soc: 1 pos_err: 0 success: 3
[INFO] digital twin mission success on i: 6 mission_id: 836
trajectory <6> selected for TrueSystem
[INFO] simulating true system on i: 7
[INFO] updating degradation parameter variance on i: 7
[INFO] updating degradation parameter values via random sampling on i: 7
[INFO] i: 7 mission_id: 837 rul_hat: 17.58 flight_time: 14.83 distance: 1083.73 R0: 0.00090 Q: 15.50 Req: 0.23485
[INFO] success on i: 7 mission_id: 837
[INFO] forecasting degradation values: r_mu: -0.000678 q_mu: 14.753683 m_mu: 0.280986
[INFO] digital twin degradation parameters: 0.0001 13.0302 0.2744
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 7, mission_id: 837
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: -0.0002 14.9905 0.2816
[INFO] simulating digital twin on i 7, mission_id: 837
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: -0.0019 15.7008 0.2875
[INFO] simulating digital twin on i 7, mission_id: 837
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: -0.0010 14.7729 0.2761
[INFO] simulating digital twin on i 7, mission_id: 837
[INFO] digital twin degradation parameters: -0.0010 14.7729 0.2761
[INFO] DigitalTwin mean parameter values: R0 = -0.00075 Q = 14.62 Req = 0.27991
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 7 mission_id: 837
trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 8
[INFO] updating degradation parameter variance on i: 8
[INFO] updating degradation parameter values via random sampling on i: 8
[INFO] i: 8 mission_id: 838 rul_hat: 17.58 flight_time: 16.36 distance: 1218.65 R0: 0.00046 Q: 14.68 Req: 0.22531
[INFO] success on i: 8 mission_id: 838
[INFO] forecasting degradation values: r_mu: 0.000777 q_mu: 15.509318 m_mu: 0.257383
[INFO] digital twin degradation parameters: 0.0001 14.5495 0.2476
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 8, mission_id: 838
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0013 15.4927 0.2567
[INFO] simulating digital twin on i 8, mission_id: 838
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0000 16.3548 0.2550
[INFO] simulating digital twin on i 8, mission_id: 838
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0001 16.6310 0.2533
[INFO] simulating digital twin on i 8, mission_id: 838
[INFO] digital twin degradation parameters: 0.0001 16.6310 0.2533
[INFO] DigitalTwin mean parameter values: R0 = 0.00039 Q = 15.76 Req = 0.25316
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 8 mission_id: 838
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 9
[INFO] updating degradation parameter variance on i: 9
[INFO] updating degradation parameter values via random sampling on i: 9
[INFO] i: 9 mission_id: 839 rul_hat: 17.58 flight_time: 13.58 distance: 1020.98 R0: 0.00064 Q: 14.66 Req: 0.22572
[INFO] success on i: 9 mission_id: 839

```

```

[INFO] forecasting degradation values: r_mu: -0.000116 q_mu: 15.329212 m_mu: 0.221227
[INFO] digital twin degradation parameters: 0.0011 15.5000 0.2510
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 9, mission_id: 839
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: -0.0009 15.1845 0.2355
[INFO] simulating digital twin on i 9, mission_id: 839
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: -0.0013 13.4187 0.1951
[INFO] simulating digital twin on i 9, mission_id: 839
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0002 15.6501 0.2294
[INFO] simulating digital twin on i 9, mission_id: 839
[INFO] digital twin degradation parameters: 0.0002 15.6501 0.2294
[INFO] DigitalTwin mean parameter values: R0 = -0.00023 Q = 14.94 Req = 0.22775
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 9 mission_id: 839
trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 10
[INFO] updating degradation parameter variance on i: 10
[INFO] updating degradation parameter values via random sampling on i: 10
[INFO] i: 10 mission_id: 840 rul_hat: 17.58 flight_time: 16.36 distance: 1218.72 R0: 0.00108 Q: 15.04 Req: 0.23303
[INFO] success on i: 10 mission_id: 840
[INFO] forecasting degradation values: r_mu: 0.000460 q_mu: 14.360375 m_mu: 0.226802
[INFO] digital twin degradation parameters: 0.0012 13.2574 0.2349
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 10, mission_id: 840
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0010 15.2020 0.2070
[INFO] simulating digital twin on i 10, mission_id: 840
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0016 14.8951 0.2256
[INFO] simulating digital twin on i 10, mission_id: 840
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0003 14.1841 0.2214
[INFO] simulating digital twin on i 10, mission_id: 840
[INFO] digital twin degradation parameters: 0.0003 14.1841 0.2214
[INFO] DigitalTwin mean parameter values: R0 = 0.00102 Q = 14.38 Req = 0.22222
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 10 mission_id: 840
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 11
[INFO] updating degradation parameter variance on i: 11
[INFO] updating degradation parameter values via random sampling on i: 11
[INFO] i: 11 mission_id: 841 rul_hat: 17.58 flight_time: 14.83 distance: 1083.34 R0: 0.00123 Q: 14.92 Req: 0.25644
[INFO] success on i: 11 mission_id: 841
[INFO] forecasting degradation values: r_mu: 0.000092 q_mu: 15.048412 m_mu: 0.219593
[INFO] digital twin degradation parameters: 0.0015 15.4219 0.2159
[INFO] DigitalTwin selecting trajectory: <3> with path_time: 17.83 to explore constraint boundary < 17.58
[INFO] simulating digital twin on i 11, mission_id: 841
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: -0.0008 15.8078 0.2250
[INFO] simulating digital twin on i 11, mission_id: 841
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0002 15.4606 0.2242
[INFO] simulating digital twin on i 11, mission_id: 841
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: -0.0008 14.9185 0.2170
[INFO] simulating digital twin on i 11, mission_id: 841
[INFO] digital twin degradation parameters: -0.0008 14.9185 0.2170
[INFO] DigitalTwin mean parameter values: R0 = 0.00002 Q = 15.40 Req = 0.22052
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 11 mission_id: 841

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trajectory <3> selected for TrueSystem
[INFO] simulating true system on i: 12
[INFO] updating degradation parameter variance on i: 12
[INFO] updating degradation parameter values via random sampling on i: 12
[INFO] i: 12 mission_id: 842 rul_hat: 17.58 flight_time: 13.58 distance: 1021.04 R0: 0.00044 Q: 14.49 Req: 0.23020
[INFO] success on i: 12 mission_id: 842
[INFO] forecasting degradation values: r_mu: 0.001047 q_mu: 14.455652 m_mu: 0.248186
[INFO] digital twin degradation parameters: 0.0001 14.3038 0.2435
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.58
[INFO] simulating digital twin on i 12, mission_id: 842
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0001 15.7224 0.2695
[INFO] simulating digital twin on i 12, mission_id: 842
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0008 13.2658 0.2405
[INFO] simulating digital twin on i 12, mission_id: 842
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0009 14.6737 0.2437
[INFO] simulating digital twin on i 12, mission_id: 842
[INFO] digital twin degradation parameters: 0.0009 14.6737 0.2437
[INFO] DigitalTwin mean parameter values: R0 = 0.00049 Q = 14.49 Req = 0.24929
stop code counts: low_soc: 1 pos_err: 0 success: 3
[INFO] digital twin mission success on i: 12 mission_id: 842
trajectory <6> selected for TrueSystem
[INFO] simulating true system on i: 13
[INFO] updating degradation parameter variance on i: 13
[INFO] updating degradation parameter values via random sampling on i: 13
[INFO] i: 13 mission_id: 843 rul_hat: 17.58 flight_time: 13.94 distance: 1048.07 R0: 0.00013 Q: 14.12 Req: 0.23039
[INFO] success on i: 13 mission_id: 843
[INFO] forecasting degradation values: r_mu: 0.001092 q_mu: 14.978558 m_mu: 0.227187
[INFO] digital twin degradation parameters: 0.0006 14.7285 0.2274
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 13, mission_id: 843
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0022 14.1465 0.2431
[INFO] simulating digital twin on i 13, mission_id: 843
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0014 14.9559 0.2303
[INFO] simulating digital twin on i 13, mission_id: 843
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: -0.0003 14.9126 0.2545
[INFO] simulating digital twin on i 13, mission_id: 843
[INFO] digital twin degradation parameters: -0.0003 14.9126 0.2545
[INFO] DigitalTwin mean parameter values: R0 = 0.00099 Q = 14.69 Req = 0.23880
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 13 mission_id: 843
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 14
[INFO] updating degradation parameter variance on i: 14
[INFO] updating degradation parameter values via random sampling on i: 14
[INFO] i: 14 mission_id: 844 rul_hat: 17.58 flight_time: 14.83 distance: 1083.29 R0: 0.00134 Q: 14.87 Req: 0.23120
[INFO] success on i: 14 mission_id: 844
[INFO] forecasting degradation values: r_mu: -0.000078 q_mu: 13.772715 m_mu: 0.209992
[INFO] digital twin degradation parameters: 0.0001 13.9516 0.2171
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 14, mission_id: 844
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0017 12.0338 0.2473
[INFO] simulating digital twin on i 14, mission_id: 844
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0002 14.5428 0.1821
[INFO] simulating digital twin on i 14, mission_id: 844
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: -0.0006 13.5586 0.2171

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[INFO] simulating digital twin on i 14, mission_id: 844
[INFO] digital twin degradation parameters: -0.0006 13.5586 0.2171
[INFO] DigitalTwin mean parameter values: R0 = 0.00035 Q = 13.52 Req = 0.21592
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 14 mission_id: 844
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 15
[INFO] updating degradation parameter variance on i: 15
[INFO] updating degradation parameter values via random sampling on i: 15
[INFO] i: 15 mission_id: 845 rul_hat: 17.58 flight_time: 14.83 distance: 1083.13 R0: 0.00017 Q: 15.19 Req: 0.22400
[INFO] success on i: 15 mission_id: 845
[INFO] forecasting degradation values: r_mu: 0.001009 q_mu: 14.242347 m_mu: 0.242964
[INFO] digital twin degradation parameters: 0.0011 14.7381 0.2484
[INFO] DigitalTwin selecting trajectory: <3> with path_time: 17.83 to explore constraint boundary < 17.58
[INFO] simulating digital twin on i 15, mission_id: 845
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0004 14.4377 0.2274
[INFO] simulating digital twin on i 15, mission_id: 845
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: -0.0001 14.9452 0.2430
[INFO] simulating digital twin on i 15, mission_id: 845
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0010 14.9348 0.2528
[INFO] simulating digital twin on i 15, mission_id: 845
[INFO] digital twin degradation parameters: 0.0010 14.9348 0.2528
[INFO] DigitalTwin mean parameter values: R0 = 0.00059 Q = 14.76 Req = 0.24287
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 15 mission_id: 845
trajectory <3> selected for TrueSystem
[INFO] simulating true system on i: 16
[INFO] updating degradation parameter variance on i: 16
[INFO] updating degradation parameter values via random sampling on i: 16
[INFO] i: 16 mission_id: 846 rul_hat: 17.58 flight_time: 13.58 distance: 1020.88 R0: 0.00207 Q: 14.99 Req: 0.23332
[INFO] success on i: 16 mission_id: 846
[INFO] forecasting degradation values: r_mu: -0.000114 q_mu: 15.057979 m_mu: 0.228718
[INFO] digital twin degradation parameters: 0.0007 15.5000 0.2025
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 16, mission_id: 846
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0008 15.7043 0.2287
[INFO] simulating digital twin on i 16, mission_id: 846
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: -0.0002 13.1933 0.2382
[INFO] simulating digital twin on i 16, mission_id: 846
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: -0.0020 13.3185 0.2300
[INFO] simulating digital twin on i 16, mission_id: 846
[INFO] digital twin degradation parameters: -0.0020 13.3185 0.2300
[INFO] DigitalTwin mean parameter values: R0 = -0.00018 Q = 14.43 Req = 0.22486
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 16 mission_id: 846
trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 17
[INFO] updating degradation parameter variance on i: 17
[INFO] updating degradation parameter values via random sampling on i: 17
[INFO] i: 17 mission_id: 847 rul_hat: 17.58 flight_time: 16.36 distance: 1218.70 R0: 0.00051 Q: 15.11 Req: 0.25589
[INFO] success on i: 17 mission_id: 847
[INFO] forecasting degradation values: r_mu: 0.002217 q_mu: 15.007052 m_mu: 0.231868
[INFO] digital twin degradation parameters: 0.0029 14.4956 0.2391
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 17, mission_id: 847
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0027 15.6715 0.2298

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[INFO] simulating digital twin on i 17, mission_id: 847
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0021 15.7528 0.1979
[INFO] simulating digital twin on i 17, mission_id: 847
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0018 14.0668 0.2257
[INFO] simulating digital twin on i 17, mission_id: 847
[INFO] digital twin degradation parameters: 0.0018 14.0668 0.2257
[INFO] DigitalTwin mean parameter values: R0 = 0.00237 Q = 15.00 Req = 0.22311
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 17 mission_id: 847
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 18
[INFO] updating degradation parameter variance on i: 18
[INFO] updating degradation parameter values via random sampling on i: 18
[INFO] i: 18 mission_id: 848 rul_hat: 17.58 flight_time: 13.58 distance: 1020.92 R0: 0.00186 Q: 15.39 Req: 0.22959
[INFO] success on i: 18 mission_id: 848
[INFO] forecasting degradation values: r_mu: 0.000629 q_mu: 15.118175 m_mu: 0.246800
[INFO] digital twin degradation parameters: 0.0002 15.2182 0.2422
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 18, mission_id: 848
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: -0.0001 14.9891 0.2132
[INFO] simulating digital twin on i 18, mission_id: 848
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0016 14.6589 0.2278
[INFO] simulating digital twin on i 18, mission_id: 848
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0004 14.0753 0.2465
[INFO] simulating digital twin on i 18, mission_id: 848
[INFO] digital twin degradation parameters: 0.0004 14.0753 0.2465
[INFO] DigitalTwin mean parameter values: R0 = 0.00052 Q = 14.74 Req = 0.23243
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 18 mission_id: 848
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 19
[INFO] updating degradation parameter variance on i: 19
[INFO] updating degradation parameter values via random sampling on i: 19
[INFO] i: 19 mission_id: 849 rul_hat: 17.58 flight_time: 13.94 distance: 1047.95 R0: 0.00088 Q: 15.50 Req: 0.26375
[INFO] success on i: 19 mission_id: 849
[INFO] forecasting degradation values: r_mu: 0.001692 q_mu: 15.559775 m_mu: 0.219131
[INFO] digital twin degradation parameters: 0.0004 15.5000 0.1975
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 19, mission_id: 849
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0023 15.3632 0.2436
[INFO] simulating digital twin on i 19, mission_id: 849
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0013 15.7956 0.2294
[INFO] simulating digital twin on i 19, mission_id: 849
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0018 16.1941 0.2241
[INFO] simulating digital twin on i 19, mission_id: 849
[INFO] digital twin degradation parameters: 0.0018 16.1941 0.2241
[INFO] DigitalTwin mean parameter values: R0 = 0.00143 Q = 15.71 Req = 0.22365
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 19 mission_id: 849
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 20
[INFO] updating degradation parameter variance on i: 20
[INFO] updating degradation parameter values via random sampling on i: 20
[INFO] i: 20 mission_id: 850 rul_hat: 17.58 flight_time: 13.94 distance: 1047.77 R0: 0.00073 Q: 13.48 Req: 0.27498

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[INFO] success on i: 20 mission_id: 850
[INFO] forecasting degradation values: r_mu: 0.001759 q_mu: 15.899185 m_mu: 0.277411
[INFO] digital twin degradation parameters: 0.0013 15.5000 0.2860
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 20, mission_id: 850
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0014 15.8105 0.3000
[INFO] simulating digital twin on i 20, mission_id: 850
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0011 16.4563 0.2821
[INFO] simulating digital twin on i 20, mission_id: 850
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0016 15.1487 0.2731
[INFO] simulating digital twin on i 20, mission_id: 850
[INFO] digital twin degradation parameters: 0.0016 15.1487 0.2731
[INFO] DigitalTwin mean parameter values: R0 = 0.00132 Q = 15.73 Req = 0.28529
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 20 mission_id: 850
trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 21
[INFO] updating degradation parameter variance on i: 21
[INFO] updating degradation parameter values via random sampling on i: 21
[INFO] i: 21 mission_id: 851 rul_hat: 17.58 flight_time: 16.36 distance: 1218.83 R0: 0.00131 Q: 13.71 Req: 0.25005
[INFO] success on i: 21 mission_id: 851
[INFO] forecasting degradation values: r_mu: 0.001197 q_mu: 14.303656 m_mu: 0.278087
[INFO] digital twin degradation parameters: 0.0005 14.2377 0.2831
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 21, mission_id: 851
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0015 13.0186 0.2936
[INFO] simulating digital twin on i 21, mission_id: 851
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0031 14.9752 0.2734
[INFO] simulating digital twin on i 21, mission_id: 851
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0015 13.5785 0.3063
[INFO] simulating digital twin on i 21, mission_id: 851
[INFO] digital twin degradation parameters: 0.0015 13.5785 0.3063
[INFO] DigitalTwin mean parameter values: R0 = 0.00167 Q = 13.95 Req = 0.28909
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 21 mission_id: 851
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 22
[INFO] updating degradation parameter variance on i: 22
[INFO] updating degradation parameter values via random sampling on i: 22
[INFO] i: 22 mission_id: 852 rul_hat: 17.58 flight_time: 14.83 distance: 1083.38 R0: 0.00215 Q: 15.27 Req: 0.23479
[INFO] success on i: 22 mission_id: 852
[INFO] forecasting degradation values: r_mu: 0.001631 q_mu: 14.666419 m_mu: 0.277541
[INFO] digital twin degradation parameters: 0.0019 14.2812 0.2729
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 22, mission_id: 852
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0009 14.5216 0.2525
[INFO] simulating digital twin on i 22, mission_id: 852
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0021 14.5851 0.2879
[INFO] simulating digital twin on i 22, mission_id: 852
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0018 15.0075 0.2557
[INFO] simulating digital twin on i 22, mission_id: 852
[INFO] digital twin degradation parameters: 0.0018 15.0075 0.2557
[INFO] DigitalTwin mean parameter values: R0 = 0.00169 Q = 14.60 Req = 0.26724
stop code counts: low_soc: 0 pos_err: 0 success: 4

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[INFO] digital twin mission success on i: 22 mission_id: 852
      trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 23
[INFO] updating degradation parameter variance on i: 23
[INFO] updating degradation parameter values via random sampling on i: 23
[INFO] i: 23 mission_id: 853 rul_hat: 17.58 flight_time: 16.36 distance: 1218.68 R0: 0.00063 Q: 14.41 Req: 0.24984
[INFO] success on i: 23 mission_id: 853
[INFO] forecasting degradation values: r_mu: 0.002147 q_mu: 14.587416 m_mu: 0.265068
[INFO] digital twin degradation parameters: 0.0030 14.3902 0.2834
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.58
[INFO] simulating digital twin on i 23, mission_id: 853
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0022 14.1408 0.2436
[INFO] simulating digital twin on i 23, mission_id: 853
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0023 15.1440 0.2608
[INFO] simulating digital twin on i 23, mission_id: 853
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0017 14.3775 0.2492
[INFO] simulating digital twin on i 23, mission_id: 853
[INFO] digital twin degradation parameters: 0.0017 14.3775 0.2492
[INFO] DigitalTwin mean parameter values: R0 = 0.00232 Q = 14.51 Req = 0.25924
      stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 23 mission_id: 853
      trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.58
[INFO] simulating true system on i: 24
[INFO] updating degradation parameter variance on i: 24
[INFO] updating degradation parameter values via random sampling on i: 24
[INFO] i: 24 mission_id: 854 rul_hat: 17.58 flight_time: 13.58 distance: 1020.94 R0: 0.00108 Q: 14.58 Req: 0.24944
[INFO] success on i: 24 mission_id: 854
[INFO] forecasting degradation values: r_mu: 0.001281 q_mu: 13.595810 m_mu: 0.266265
[INFO] digital twin degradation parameters: 0.0012 14.0054 0.2678
[INFO] DigitalTwin selecting trajectory: <3> with path_time: 17.83 to explore constraint boundary < 17.58
[INFO] simulating digital twin on i 24, mission_id: 854
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0027 13.1113 0.2738
[INFO] simulating digital twin on i 24, mission_id: 854
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0011 13.9979 0.2747
[INFO] simulating digital twin on i 24, mission_id: 854
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: -0.0004 12.7067 0.2457
[INFO] simulating digital twin on i 24, mission_id: 854
[INFO] digital twin degradation parameters: -0.0004 12.7067 0.2457
[INFO] DigitalTwin mean parameter values: R0 = 0.00115 Q = 13.46 Req = 0.26551
      stop code counts: low_soc: 2 pos_err: 0 success: 2
[WARN] DigitalTwin low soc threshold exceeded on i: 24 mission_id: 854
[INFO] updating RUL from 17.58 to 16.63
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.63
[INFO] simulating digital twin on i 24, mission_id: 854
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0010 14.1401 0.2740
[INFO] simulating digital twin on i 24, mission_id: 854
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0005 13.8621 0.2556
[INFO] simulating digital twin on i 24, mission_id: 854
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0024 13.5740 0.2896
[INFO] simulating digital twin on i 24, mission_id: 854
[INFO] digital twin degradation parameters: 0.0024 13.5740 0.2896
[INFO] DigitalTwin mean parameter values: R0 = 0.00089 Q = 13.57 Req = 0.26622
      stop code counts: low_soc: 0 pos_err: 0 success: 4

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[INFO] digital twin mission success on i: 24 mission_id: 854
      trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.63
[INFO] simulating true system on i: 25
[INFO] updating degradation parameter variance on i: 25
[INFO] updating degradation parameter values via random sampling on i: 25
[INFO] i: 25 mission_id: 855 rul_hat: 16.63 flight_time: 13.58 distance: 1021.05 R0: 0.00116 Q: 15.07 Req: 0.24846
[INFO] success on i: 25 mission_id: 855
[INFO] forecasting degradation values: r_mu: 0.001406 q_mu: 13.595040 m_mu: 0.262710
[INFO] digital twin degradation parameters: 0.0001 12.9468 0.2713
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 16.63
[INFO] simulating digital twin on i 25, mission_id: 855
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0009 13.7597 0.2488
[INFO] simulating digital twin on i 25, mission_id: 855
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0021 13.1722 0.2880
[INFO] simulating digital twin on i 25, mission_id: 855
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0006 13.7265 0.2414
[INFO] simulating digital twin on i 25, mission_id: 855
[INFO] digital twin degradation parameters: 0.0006 13.7265 0.2414
[INFO] DigitalTwin mean parameter values: R0 = 0.00095 Q = 13.40 Req = 0.26239
      stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 25 mission_id: 855
      trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 16.63
[INFO] simulating true system on i: 26
[INFO] updating degradation parameter variance on i: 26
[INFO] updating degradation parameter values via random sampling on i: 26
[INFO] i: 26 mission_id: 856 rul_hat: 16.63 flight_time: 16.36 distance: 1218.76 R0: 0.00097 Q: 14.28 Req: 0.25541
[INFO] success on i: 26 mission_id: 856
[INFO] forecasting degradation values: r_mu: 0.000233 q_mu: 14.103792 m_mu: 0.249970
[INFO] digital twin degradation parameters: 0.0009 14.2991 0.2448
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.63
[INFO] simulating digital twin on i 26, mission_id: 856
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0003 14.4751 0.2556
[INFO] simulating digital twin on i 26, mission_id: 856
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: -0.0005 14.5975 0.2409
[INFO] simulating digital twin on i 26, mission_id: 856
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: -0.0002 14.2188 0.2457
[INFO] simulating digital twin on i 26, mission_id: 856
[INFO] digital twin degradation parameters: -0.0002 14.2188 0.2457
[INFO] DigitalTwin mean parameter values: R0 = 0.00013 Q = 14.40 Req = 0.24679
      stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 26 mission_id: 856
      trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.63
[INFO] simulating true system on i: 27
[INFO] updating degradation parameter variance on i: 27
[INFO] updating degradation parameter values via random sampling on i: 27
[INFO] i: 27 mission_id: 857 rul_hat: 16.63 flight_time: 13.94 distance: 1047.65 R0: 0.00144 Q: 15.03 Req: 0.26458
[INFO] success on i: 27 mission_id: 857
[INFO] forecasting degradation values: r_mu: 0.001236 q_mu: 14.128702 m_mu: 0.245293
[INFO] digital twin degradation parameters: 0.0011 14.3384 0.2421
[INFO] DigitalTwin selecting trajectory: <15> with path_time: 17.63 to explore constraint boundary < 16.63
[INFO] simulating digital twin on i 27, mission_id: 857
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0008 14.3046 0.2534
[INFO] simulating digital twin on i 27, mission_id: 857
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0013 15.2358 0.2371

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[INFO] simulating digital twin on i 27, mission_id: 857
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0007 13.0088 0.2576
[INFO] simulating digital twin on i 27, mission_id: 857
[INFO] digital twin degradation parameters: 0.0007 13.0088 0.2576
[INFO] DigitalTwin mean parameter values: R0 = 0.00097 Q = 14.22 Req = 0.24754
stop code counts: low_soc: 1 pos_err: 0 success: 3
[INFO] digital twin mission success on i: 27 mission_id: 857
trajectory <15> selected for TrueSystem
[INFO] simulating true system on i: 28
[INFO] updating degradation parameter variance on i: 28
[INFO] updating degradation parameter values via random sampling on i: 28
[INFO] i: 28 mission_id: 858 rul_hat: 16.63 flight_time: 14.83 distance: 1083.47 R0: 0.00223 Q: 14.75 Req: 0.25485
[INFO] success on i: 28 mission_id: 858
[INFO] forecasting degradation values: r_mu: 0.001013 q_mu: 14.534430 m_mu: 0.263529
[INFO] digital twin degradation parameters: 0.0011 14.8116 0.2649
[INFO] DigitalTwin selecting trajectory: <3> with path_time: 17.83 to explore constraint boundary < 16.63
[INFO] simulating digital twin on i 28, mission_id: 858
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: -0.0003 13.8158 0.2490
[INFO] simulating digital twin on i 28, mission_id: 858
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0007 14.4283 0.2606
[INFO] simulating digital twin on i 28, mission_id: 858
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0014 14.7797 0.2735
[INFO] simulating digital twin on i 28, mission_id: 858
[INFO] digital twin degradation parameters: 0.0014 14.7797 0.2735
[INFO] DigitalTwin mean parameter values: R0 = 0.00071 Q = 14.46 Req = 0.26201
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 28 mission_id: 858
trajectory <3> selected for TrueSystem
[INFO] new RUL update is available, 16.84 replaces 16.63
[INFO] simulating true system on i: 29
[INFO] updating degradation parameter variance on i: 29
[INFO] updating degradation parameter values via random sampling on i: 29
[INFO] i: 29 mission_id: 859 rul_hat: 16.84 flight_time: 17.84 distance: 1302.04 R0: 0.00068 Q: 13.17 Req: 0.26329
[INFO] success on i: 29 mission_id: 859
[INFO] forecasting degradation values: r_mu: 0.001990 q_mu: 14.859086 m_mu: 0.253390
[INFO] digital twin degradation parameters: 0.0007 14.9005 0.2539
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 16.84
[INFO] simulating digital twin on i 29, mission_id: 859
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0016 15.0053 0.2566
[INFO] simulating digital twin on i 29, mission_id: 859
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0020 14.4818 0.2375
[INFO] simulating digital twin on i 29, mission_id: 859
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0022 14.0265 0.2400
[INFO] simulating digital twin on i 29, mission_id: 859
[INFO] digital twin degradation parameters: 0.0022 14.0265 0.2400
[INFO] DigitalTwin mean parameter values: R0 = 0.00164 Q = 14.60 Req = 0.24698
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 29 mission_id: 859
trajectory <6> selected for TrueSystem
[INFO] new RUL update is available, 17.78 replaces 16.84
[INFO] simulating true system on i: 30
[INFO] updating degradation parameter variance on i: 30
[INFO] updating degradation parameter values via random sampling on i: 30
[INFO] i: 30 mission_id: 860 rul_hat: 17.78 flight_time: 17.33 distance: 1259.30 R0: 0.00154 Q: 15.15 Req: 0.24830
[WARN] true system low soc threshold exceeded on i: 30 mission_id: 860
[INFO] forecasting degradation values: r_mu: 0.001135 q_mu: 14.518401 m_mu: 0.258196
[INFO] digital twin degradation parameters: 0.0019 14.3079 0.2711
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.78

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[INFO] simulating digital twin on i 30, mission_id: 860
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0005 13.8821 0.2548
[INFO] simulating digital twin on i 30, mission_id: 860
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0008 14.2691 0.2707
[INFO] simulating digital twin on i 30, mission_id: 860
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0009 15.2160 0.2514
[INFO] simulating digital twin on i 30, mission_id: 860
[INFO] digital twin degradation parameters: 0.0009 15.2160 0.2514
[INFO] DigitalTwin mean parameter values: R0 = 0.00103 Q = 14.42 Req = 0.26200
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 30 mission_id: 860
trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.78
[INFO] simulating true system on i: 31
[INFO] updating degradation parameter variance on i: 31
[INFO] updating degradation parameter values via random sampling on i: 31
[INFO] i: 31 mission_id: 861 rul_hat: 17.78 flight_time: 16.36 distance: 1218.83 R0: 0.00235 Q: 14.27 Req: 0.25490
[INFO] success on i: 31 mission_id: 861
[INFO] forecasting degradation values: r_mu: 0.002331 q_mu: 14.976402 m_mu: 0.251830
[INFO] digital twin degradation parameters: 0.0030 14.7280 0.2464
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating digital twin on i 31, mission_id: 861
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0020 15.3658 0.2473
[INFO] simulating digital twin on i 31, mission_id: 861
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0028 15.8259 0.2318
[INFO] simulating digital twin on i 31, mission_id: 861
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0031 15.8512 0.2524
[INFO] simulating digital twin on i 31, mission_id: 861
[INFO] digital twin degradation parameters: 0.0031 15.8512 0.2524
[INFO] DigitalTwin mean parameter values: R0 = 0.00273 Q = 15.44 Req = 0.24447
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 31 mission_id: 861
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating true system on i: 32
[INFO] updating degradation parameter variance on i: 32
[INFO] updating degradation parameter values via random sampling on i: 32
[INFO] i: 32 mission_id: 862 rul_hat: 17.78 flight_time: 13.94 distance: 1047.68 R0: 0.00292 Q: 14.66 Req: 0.23812
[INFO] success on i: 32 mission_id: 862
[INFO] forecasting degradation values: r_mu: 0.002951 q_mu: 15.443836 m_mu: 0.254134
[INFO] digital twin degradation parameters: 0.0014 15.2471 0.2629
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.78
[INFO] simulating digital twin on i 32, mission_id: 862
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0026 15.5288 0.2341
[INFO] simulating digital twin on i 32, mission_id: 862
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0024 14.9607 0.2605
[INFO] simulating digital twin on i 32, mission_id: 862
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0029 14.7621 0.2540
[INFO] simulating digital twin on i 32, mission_id: 862
[INFO] digital twin degradation parameters: 0.0029 14.7621 0.2540
[INFO] DigitalTwin mean parameter values: R0 = 0.00234 Q = 15.12 Req = 0.25286
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 32 mission_id: 862
trajectory <6> selected for TrueSystem
[INFO] new RUL update is available, 17.78 replaces 17.78
[INFO] simulating true system on i: 33

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[INFO] updating degradation parameter variance on i: 33
[INFO] updating degradation parameter values via random sampling on i: 33
[INFO] i: 33 mission_id: 863 rul_hat: 17.78 flight_time: 17.63 distance: 1283.83 R0: 0.00234 Q: 14.62 Req: 0.25863
[INFO] success on i: 33 mission_id: 863
[INFO] forecasting degradation values: r_mu: 0.003058 q_mu: 14.897019 m_mu: 0.254709
[INFO] digital twin degradation parameters: 0.0037 15.0016 0.2613
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.78
[INFO] simulating digital twin on i 33, mission_id: 863
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0034 15.7161 0.2550
[INFO] simulating digital twin on i 33, mission_id: 863
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0030 15.8838 0.2486
[INFO] simulating digital twin on i 33, mission_id: 863
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0031 15.4305 0.2565
[INFO] simulating digital twin on i 33, mission_id: 863
[INFO] digital twin degradation parameters: 0.0031 15.4305 0.2565
[INFO] DigitalTwin mean parameter values: R0 = 0.00328 Q = 15.51 Req = 0.25535
      stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 33 mission_id: 863
      trajectory <6> selected for TrueSystem
[INFO] new RUL update is available, 17.78 replaces 17.78
[INFO] simulating true system on i: 34
[INFO] updating degradation parameter variance on i: 34
[INFO] updating degradation parameter values via random sampling on i: 34
[INFO] i: 34 mission_id: 864 rul_hat: 17.78 flight_time: 17.63 distance: 1283.88 R0: 0.00217 Q: 13.75 Req: 0.25730
[INFO] success on i: 34 mission_id: 864
[INFO] forecasting degradation values: r_mu: 0.002760 q_mu: 14.406845 m_mu: 0.262190
[INFO] digital twin degradation parameters: 0.0033 14.5283 0.2725
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.78
[INFO] simulating digital twin on i 34, mission_id: 864
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0029 14.7726 0.2672
[INFO] simulating digital twin on i 34, mission_id: 864
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0019 14.1695 0.2766
[INFO] simulating digital twin on i 34, mission_id: 864
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0027 14.7388 0.2504
[INFO] simulating digital twin on i 34, mission_id: 864
[INFO] digital twin degradation parameters: 0.0027 14.7388 0.2504
[INFO] DigitalTwin mean parameter values: R0 = 0.00271 Q = 14.55 Req = 0.26666
      stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 34 mission_id: 864
      trajectory <6> selected for TrueSystem
[INFO] new RUL update is available, 17.78 replaces 17.78
[INFO] simulating true system on i: 35
[INFO] updating degradation parameter variance on i: 35
[INFO] updating degradation parameter values via random sampling on i: 35
[INFO] i: 35 mission_id: 865 rul_hat: 17.78 flight_time: 14.83 distance: 1083.51 R0: 0.00094 Q: 14.71 Req: 0.25292
[INFO] success on i: 35 mission_id: 865
[INFO] forecasting degradation values: r_mu: 0.003339 q_mu: 14.178706 m_mu: 0.257007
[INFO] digital twin degradation parameters: 0.0027 14.1577 0.2352
[INFO] DigitalTwin selecting trajectory: <15> with path_time: 17.63 that meets constraint: path_time < 17.78
[INFO] simulating digital twin on i 35, mission_id: 865
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0027 13.5218 0.2372
[INFO] simulating digital twin on i 35, mission_id: 865
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0035 13.2860 0.2583
[INFO] simulating digital twin on i 35, mission_id: 865
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0039 14.1775 0.2581
[INFO] simulating digital twin on i 35, mission_id: 865

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[INFO] digital twin degradation parameters: 0.0039 14.1775 0.2581
[INFO] DigitalTwin mean parameter values: R0 = 0.00320 Q = 13.79 Req = 0.24718
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 35 mission_id: 865
trajectory <15> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <15> with path_time: 17.63 that meets constraint: path_time < 17.78
[INFO] simulating true system on i: 36
[INFO] updating degradation parameter variance on i: 36
[INFO] updating degradation parameter values via random sampling on i: 36
[INFO] i: 36 mission_id: 866 rul_hat: 17.78 flight_time: 17.63 distance: 1283.82 R0: 0.00164 Q: 13.68 Req: 0.25511
[INFO] success on i: 36 mission_id: 866
[INFO] forecasting degradation values: r_mu: 0.002270 q_mu: 14.236659 m_mu: 0.254153
[INFO] digital twin degradation parameters: 0.0029 15.1927 0.2493
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.78
[INFO] simulating digital twin on i 36, mission_id: 866
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0025 14.1118 0.2412
[INFO] simulating digital twin on i 36, mission_id: 866
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0036 12.9389 0.2484
[INFO] simulating digital twin on i 36, mission_id: 866
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0014 13.8868 0.2577
[INFO] simulating digital twin on i 36, mission_id: 866
[INFO] digital twin degradation parameters: 0.0014 13.8868 0.2577
[INFO] DigitalTwin mean parameter values: R0 = 0.00260 Q = 14.03 Req = 0.24917
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 36 mission_id: 866
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.78
[INFO] simulating true system on i: 37
[INFO] updating degradation parameter variance on i: 37
[INFO] updating degradation parameter values via random sampling on i: 37
[INFO] i: 37 mission_id: 867 rul_hat: 17.78 flight_time: 14.83 distance: 1083.38 R0: 0.00202 Q: 14.10 Req: 0.26474
[INFO] success on i: 37 mission_id: 867
[INFO] forecasting degradation values: r_mu: 0.002515 q_mu: 13.647468 m_mu: 0.252922
[INFO] digital twin degradation parameters: 0.0029 13.9971 0.2482
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.78
[INFO] simulating digital twin on i 37, mission_id: 867
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0041 14.2217 0.2656
[INFO] simulating digital twin on i 37, mission_id: 867
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0025 12.9517 0.2488
[INFO] simulating digital twin on i 37, mission_id: 867
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0020 13.3429 0.2590
[INFO] simulating digital twin on i 37, mission_id: 867
[INFO] digital twin degradation parameters: 0.0020 13.3429 0.2590
[INFO] DigitalTwin mean parameter values: R0 = 0.00290 Q = 13.63 Req = 0.25544
stop code counts: low_soc: 3 pos_err: 0 success: 1
[WARN] DigitalTwin low soc threshold exceeded on i: 37 mission_id: 867
[INFO] updating RUL from 17.78 to 17.24
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 37, mission_id: 867
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0023 13.5606 0.2574
[INFO] simulating digital twin on i 37, mission_id: 867
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0019 13.8188 0.2538
[INFO] simulating digital twin on i 37, mission_id: 867
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0034 13.5324 0.2514
[INFO] simulating digital twin on i 37, mission_id: 867

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[INFO] digital twin degradation parameters: 0.0034 13.5324 0.2514
[INFO] DigitalTwin mean parameter values: R0 = 0.00239 Q = 13.56 Req = 0.25542
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 37 mission_id: 867
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 38
[INFO] updating degradation parameter variance on i: 38
[INFO] updating degradation parameter values via random sampling on i: 38
[INFO] i: 38 mission_id: 868 rul_hat: 17.24 flight_time: 14.83 distance: 1083.78 R0: 0.00125 Q: 13.73 Req: 0.26013
[INFO] success on i: 38 mission_id: 868
[INFO] forecasting degradation values: r_mu: 0.002782 q_mu: 13.788903 m_mu: 0.256095
[INFO] digital twin degradation parameters: 0.0026 14.0559 0.2465
[INFO] DigitalTwin selecting trajectory: <3> with path_time: 17.83 to explore constraint boundary < 17.24
[INFO] simulating digital twin on i 38, mission_id: 868
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0034 13.6686 0.2543
[INFO] simulating digital twin on i 38, mission_id: 868
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0032 14.0835 0.2441
[INFO] simulating digital twin on i 38, mission_id: 868
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0018 13.2070 0.2409
[INFO] simulating digital twin on i 38, mission_id: 868
[INFO] digital twin degradation parameters: 0.0018 13.2070 0.2409
[INFO] DigitalTwin mean parameter values: R0 = 0.00278 Q = 13.75 Req = 0.24644
stop code counts: low_soc: 1 pos_err: 0 success: 3
[INFO] digital twin mission success on i: 38 mission_id: 868
trajectory <3> selected for TrueSystem
[INFO] simulating true system on i: 39
[INFO] updating degradation parameter variance on i: 39
[INFO] updating degradation parameter values via random sampling on i: 39
[INFO] i: 39 mission_id: 869 rul_hat: 17.24 flight_time: 14.83 distance: 1083.52 R0: 0.00181 Q: 13.73 Req: 0.26557
[INFO] success on i: 39 mission_id: 869
[INFO] forecasting degradation values: r_mu: 0.001730 q_mu: 13.087810 m_mu: 0.257530
[INFO] digital twin degradation parameters: 0.0020 13.0412 0.2683
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 39, mission_id: 869
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0019 13.2694 0.2499
[INFO] simulating digital twin on i 39, mission_id: 869
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0019 12.8201 0.2481
[INFO] simulating digital twin on i 39, mission_id: 869
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0010 13.6275 0.2486
[INFO] simulating digital twin on i 39, mission_id: 869
[INFO] digital twin degradation parameters: 0.0010 13.6275 0.2486
[INFO] DigitalTwin mean parameter values: R0 = 0.00172 Q = 13.19 Req = 0.25372
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 39 mission_id: 869
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 40
[INFO] updating degradation parameter variance on i: 40
[INFO] updating degradation parameter values via random sampling on i: 40
[INFO] i: 40 mission_id: 870 rul_hat: 17.24 flight_time: 13.94 distance: 1047.78 R0: 0.00199 Q: 13.81 Req: 0.25495
[INFO] success on i: 40 mission_id: 870
[INFO] forecasting degradation values: r_mu: 0.001490 q_mu: 13.030546 m_mu: 0.265876
[INFO] digital twin degradation parameters: 0.0005 12.4762 0.2513
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 40, mission_id: 870
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0013 14.0222 0.2600
[INFO] simulating digital twin on i 40, mission_id: 870

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[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0013 12.2302 0.2610
[INFO] simulating digital twin on i 40, mission_id: 870
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0007 13.0460 0.2746
[INFO] simulating digital twin on i 40, mission_id: 870
[INFO] digital twin degradation parameters: 0.0007 13.0460 0.2746
[INFO] DigitalTwin mean parameter values: R0 = 0.00095 Q = 12.94 Req = 0.26172
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 40 mission_id: 870
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 41
[INFO] updating degradation parameter variance on i: 41
[INFO] updating degradation parameter values via random sampling on i: 41
[INFO] i: 41 mission_id: 871 rul_hat: 17.24 flight_time: 14.83 distance: 1083.30 R0: 0.00240 Q: 14.00 Req: 0.24229
[INFO] success on i: 41 mission_id: 871
[INFO] forecasting degradation values: r_mu: 0.002412 q_mu: 13.936697 m_mu: 0.262238
[INFO] digital twin degradation parameters: 0.0033 14.9617 0.2634
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 41, mission_id: 871
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0021 13.7018 0.2711
[INFO] simulating digital twin on i 41, mission_id: 871
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0016 12.9583 0.2664
[INFO] simulating digital twin on i 41, mission_id: 871
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0027 13.9843 0.2672
[INFO] simulating digital twin on i 41, mission_id: 871
[INFO] digital twin degradation parameters: 0.0027 13.9843 0.2672
[INFO] DigitalTwin mean parameter values: R0 = 0.00239 Q = 13.90 Req = 0.26705
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 41 mission_id: 871
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 42
[INFO] updating degradation parameter variance on i: 42
[INFO] updating degradation parameter values via random sampling on i: 42
[INFO] i: 42 mission_id: 872 rul_hat: 17.24 flight_time: 13.58 distance: 1020.94 R0: 0.00285 Q: 14.81 Req: 0.25367
[INFO] success on i: 42 mission_id: 872
[INFO] forecasting degradation values: r_mu: 0.001811 q_mu: 13.056244 m_mu: 0.255493
[INFO] digital twin degradation parameters: 0.0023 13.1411 0.2506
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 42, mission_id: 872
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0016 13.0790 0.2478
[INFO] simulating digital twin on i 42, mission_id: 872
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0009 13.1403 0.2549
[INFO] simulating digital twin on i 42, mission_id: 872
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0025 13.4491 0.2658
[INFO] simulating digital twin on i 42, mission_id: 872
[INFO] digital twin degradation parameters: 0.0025 13.4491 0.2658
[INFO] DigitalTwin mean parameter values: R0 = 0.00183 Q = 13.20 Req = 0.25474
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 42 mission_id: 872
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 43
[INFO] updating degradation parameter variance on i: 43
[INFO] updating degradation parameter values via random sampling on i: 43
[INFO] i: 43 mission_id: 873 rul_hat: 17.24 flight_time: 13.58 distance: 1020.92 R0: 0.00185 Q: 13.86 Req: 0.24777
[INFO] success on i: 43 mission_id: 873

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[INFO] forecasting degradation values: r_mu: 0.002254 q_mu: 13.887301 m_mu: 0.255227
[INFO] digital twin degradation parameters: 0.0025 15.2261 0.2621
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 43, mission_id: 873
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0016 13.2036 0.2620
[INFO] simulating digital twin on i 43, mission_id: 873
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0018 14.0390 0.2686
[INFO] simulating digital twin on i 43, mission_id: 873
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0025 14.3335 0.2400
[INFO] simulating digital twin on i 43, mission_id: 873
[INFO] digital twin degradation parameters: 0.0025 14.3335 0.2400
[INFO] DigitalTwin mean parameter values: R0 = 0.00211 Q = 14.20 Req = 0.25819
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 43 mission_id: 873
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 44
[INFO] updating degradation parameter variance on i: 44
[INFO] updating degradation parameter values via random sampling on i: 44
[INFO] i: 44 mission_id: 874 rul_hat: 17.24 flight_time: 13.94 distance: 1047.67 R0: 0.00273 Q: 15.30 Req: 0.26545
[INFO] success on i: 44 mission_id: 874
[INFO] forecasting degradation values: r_mu: 0.001577 q_mu: 13.484215 m_mu: 0.255386
[INFO] digital twin degradation parameters: 0.0007 13.3887 0.2508
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 44, mission_id: 874
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0018 13.3132 0.2498
[INFO] simulating digital twin on i 44, mission_id: 874
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0012 13.8854 0.2382
[INFO] simulating digital twin on i 44, mission_id: 874
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0015 13.6113 0.2493
[INFO] simulating digital twin on i 44, mission_id: 874
[INFO] digital twin degradation parameters: 0.0015 13.6113 0.2493
[INFO] DigitalTwin mean parameter values: R0 = 0.00130 Q = 13.55 Req = 0.24705
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 44 mission_id: 874
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 45
[INFO] updating degradation parameter variance on i: 45
[INFO] updating degradation parameter values via random sampling on i: 45
[INFO] i: 45 mission_id: 875 rul_hat: 17.24 flight_time: 13.94 distance: 1047.75 R0: 0.00269 Q: 14.24 Req: 0.25263
[INFO] success on i: 45 mission_id: 875
[INFO] forecasting degradation values: r_mu: 0.002876 q_mu: 15.132418 m_mu: 0.256686
[INFO] digital twin degradation parameters: 0.0030 15.0091 0.2530
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 45, mission_id: 875
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0018 14.9492 0.2518
[INFO] simulating digital twin on i 45, mission_id: 875
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0024 15.4327 0.2501
[INFO] simulating digital twin on i 45, mission_id: 875
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0032 15.5813 0.2553
[INFO] simulating digital twin on i 45, mission_id: 875
[INFO] digital twin degradation parameters: 0.0032 15.5813 0.2553
[INFO] DigitalTwin mean parameter values: R0 = 0.00259 Q = 15.24 Req = 0.25254
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 45 mission_id: 875

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trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 46
[INFO] updating degradation parameter variance on i: 46
[INFO] updating degradation parameter values via random sampling on i: 46
[INFO] i: 46 mission_id: 876 rul_hat: 17.24 flight_time: 13.94 distance: 1047.62 R0: 0.00265 Q: 14.54 Req: 0.26099
[INFO] success on i: 46 mission_id: 876
[INFO] forecasting degradation values: r_mu: 0.003198 q_mu: 14.559471 m_mu: 0.250359
[INFO] digital twin degradation parameters: 0.0035 13.9913 0.2601
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 46, mission_id: 876
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0040 14.5312 0.2543
[INFO] simulating digital twin on i 46, mission_id: 876
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0030 14.1002 0.2235
[INFO] simulating digital twin on i 46, mission_id: 876
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0035 14.4305 0.2486
[INFO] simulating digital twin on i 46, mission_id: 876
[INFO] digital twin degradation parameters: 0.0035 14.4305 0.2486
[INFO] DigitalTwin mean parameter values: R0 = 0.00350 Q = 14.26 Req = 0.24662
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 46 mission_id: 876
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 47
[INFO] updating degradation parameter variance on i: 47
[INFO] updating degradation parameter values via random sampling on i: 47
[INFO] i: 47 mission_id: 877 rul_hat: 17.24 flight_time: 14.83 distance: 1083.64 R0: 0.00280 Q: 13.60 Req: 0.25613
[INFO] success on i: 47 mission_id: 877
[INFO] forecasting degradation values: r_mu: 0.003851 q_mu: 14.231657 m_mu: 0.255004
[INFO] digital twin degradation parameters: 0.0045 14.4947 0.2441
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.24
[INFO] simulating digital twin on i 47, mission_id: 877
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0040 14.6463 0.2558
[INFO] simulating digital twin on i 47, mission_id: 877
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0032 14.3664 0.2450
[INFO] simulating digital twin on i 47, mission_id: 877
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0033 13.9440 0.2446
[INFO] simulating digital twin on i 47, mission_id: 877
[INFO] digital twin degradation parameters: 0.0033 13.9440 0.2446
[INFO] DigitalTwin mean parameter values: R0 = 0.00375 Q = 14.36 Req = 0.24738
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 47 mission_id: 877
trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 17.24
[INFO] simulating true system on i: 48
[INFO] updating degradation parameter variance on i: 48
[INFO] updating degradation parameter values via random sampling on i: 48
[INFO] i: 48 mission_id: 878 rul_hat: 17.24 flight_time: 16.36 distance: 1218.85 R0: 0.00252 Q: 13.82 Req: 0.26061
[INFO] success on i: 48 mission_id: 878
[INFO] forecasting degradation values: r_mu: 0.003743 q_mu: 14.430607 m_mu: 0.253350
[INFO] digital twin degradation parameters: 0.0035 14.2544 0.2492
[INFO] DigitalTwin selecting trajectory: <3> with path_time: 17.83 to explore constraint boundary < 17.24
[INFO] simulating digital twin on i 48, mission_id: 878
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0038 13.7998 0.2399
[INFO] simulating digital twin on i 48, mission_id: 878
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0027 15.5508 0.2614
[INFO] simulating digital twin on i 48, mission_id: 878

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[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0039 14.0117 0.2439
[INFO] simulating digital twin on i 48, mission_id: 878
[INFO] digital twin degradation parameters: 0.0039 14.0117 0.2439
[INFO] DigitalTwin mean parameter values: R0 = 0.00346 Q = 14.40 Req = 0.24860
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 48 mission_id: 878
trajectory <3> selected for TrueSystem
[INFO] simulating true system on i: 49
[INFO] updating degradation parameter variance on i: 49
[INFO] updating degradation parameter values via random sampling on i: 49
[INFO] i: 49 mission_id: 879 rul_hat: 17.24 flight_time: 13.58 distance: 1021.12 R0: 0.00187 Q: 14.00 Req: 0.26294
[INFO] success on i: 49 mission_id: 879
[INFO] forecasting degradation values: r_mu: 0.003278 q_mu: 14.311479 m_mu: 0.254581
[INFO] digital twin degradation parameters: 0.0022 14.6648 0.2513
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.24
[INFO] simulating digital twin on i 49, mission_id: 879
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0035 13.8317 0.2496
[INFO] simulating digital twin on i 49, mission_id: 879
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0027 14.4764 0.2650
[INFO] simulating digital twin on i 49, mission_id: 879
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0030 14.4948 0.2505
[INFO] simulating digital twin on i 49, mission_id: 879
[INFO] digital twin degradation parameters: 0.0030 14.4948 0.2505
[INFO] DigitalTwin mean parameter values: R0 = 0.00284 Q = 14.37 Req = 0.25410
stop code counts: low_soc: 1 pos_err: 0 success: 3
[INFO] digital twin mission success on i: 49 mission_id: 879
trajectory <6> selected for TrueSystem
[INFO] new RUL update is available, 17.71 replaces 17.24
[INFO] simulating true system on i: 50
[INFO] updating degradation parameter variance on i: 50
[INFO] updating degradation parameter values via random sampling on i: 50
[INFO] i: 50 mission_id: 880 rul_hat: 17.71 flight_time: 13.94 distance: 1047.75 R0: 0.00291 Q: 13.74 Req: 0.25762
[INFO] success on i: 50 mission_id: 880
[INFO] forecasting degradation values: r_mu: 0.003098 q_mu: 14.296341 m_mu: 0.260930
[INFO] digital twin degradation parameters: 0.0030 14.2178 0.2542
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.71
[INFO] simulating digital twin on i 50, mission_id: 880
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0030 14.2125 0.2439
[INFO] simulating digital twin on i 50, mission_id: 880
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0027 13.7251 0.2579
[INFO] simulating digital twin on i 50, mission_id: 880
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0034 14.9209 0.2749
[INFO] simulating digital twin on i 50, mission_id: 880
[INFO] digital twin degradation parameters: 0.0034 14.9209 0.2749
[INFO] DigitalTwin mean parameter values: R0 = 0.00301 Q = 14.27 Req = 0.25772
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 50 mission_id: 880
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.71
[INFO] simulating true system on i: 51
[INFO] updating degradation parameter variance on i: 51
[INFO] updating degradation parameter values via random sampling on i: 51
[INFO] i: 51 mission_id: 881 rul_hat: 17.71 flight_time: 14.83 distance: 1083.37 R0: 0.00288 Q: 14.01 Req: 0.27104
[INFO] success on i: 51 mission_id: 881
[INFO] forecasting degradation values: r_mu: 0.003349 q_mu: 13.944735 m_mu: 0.261578
[INFO] digital twin degradation parameters: 0.0036 14.2508 0.2674
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.71
[INFO] simulating digital twin on i 51, mission_id: 881

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[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0033 13.6406 0.2564
[INFO] simulating digital twin on i 51, mission_id: 881
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0040 13.6208 0.2523
[INFO] simulating digital twin on i 51, mission_id: 881
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0035 14.7490 0.2618
[INFO] simulating digital twin on i 51, mission_id: 881
[INFO] digital twin degradation parameters: 0.0035 14.7490 0.2618
[INFO] DigitalTwin mean parameter values: R0 = 0.00359 Q = 14.07 Req = 0.25947
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 51 mission_id: 881
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.71
[INFO] simulating true system on i: 52
[INFO] updating degradation parameter variance on i: 52
[INFO] updating degradation parameter values via random sampling on i: 52
[INFO] i: 52 mission_id: 882 rul_hat: 17.71 flight_time: 14.83 distance: 1083.88 R0: 0.00320 Q: 13.75 Req: 0.27770
[INFO] success on i: 52 mission_id: 882
[INFO] forecasting degradation values: r_mu: 0.002974 q_mu: 13.759128 m_mu: 0.274297
[INFO] digital twin degradation parameters: 0.0030 13.9659 0.2674
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.71
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0024 13.7746 0.2710
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0030 13.6614 0.2729
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0025 13.6330 0.2799
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] digital twin degradation parameters: 0.0025 13.6330 0.2799
[INFO] DigitalTwin mean parameter values: R0 = 0.00273 Q = 13.76 Req = 0.27280
stop code counts: low_soc: 4 pos_err: 0 success: 0
[WARN] DigitalTwin low soc threshold exceeded on i: 52 mission_id: 882
[INFO] updating RUL from 17.71 to 17.41
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.41
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0041 14.3543 0.2755
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0028 13.4867 0.2803
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0026 13.5790 0.2807
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] digital twin degradation parameters: 0.0026 13.5790 0.2807
[INFO] DigitalTwin mean parameter values: R0 = 0.00302 Q = 13.76 Req = 0.27910
stop code counts: low_soc: 3 pos_err: 0 success: 1
[WARN] DigitalTwin low soc threshold exceeded on i: 52 mission_id: 882
[INFO] updating RUL from 17.41 to 17.23
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.23
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0032 13.6028 0.2706
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0034 13.4974 0.2829
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] resampling for twin run # 4

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[INFO] digital twin degradation parameters: 0.0034 13.8713 0.2743
[INFO] simulating digital twin on i 52, mission_id: 882
[INFO] digital twin degradation parameters: 0.0034 13.8713 0.2743
[INFO] DigitalTwin mean parameter values: R0 = 0.00314 Q = 13.64 Req = 0.27712
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 52 mission_id: 882
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.23
[INFO] simulating true system on i: 53
[INFO] updating degradation parameter variance on i: 53
[INFO] updating degradation parameter values via random sampling on i: 53
[INFO] i: 53 mission_id: 883 rul_hat: 17.23 flight_time: 13.94 distance: 1047.72 R0: 0.00333 Q: 15.44 Req: 0.26544
[INFO] success on i: 53 mission_id: 883
[INFO] forecasting degradation values: r_mu: 0.003266 q_mu: 13.402635 m_mu: 0.285602
[INFO] digital twin degradation parameters: 0.0025 14.1304 0.2899
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.23
[INFO] simulating digital twin on i 53, mission_id: 883
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0030 13.6120 0.2877
[INFO] simulating digital twin on i 53, mission_id: 883
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0029 12.9980 0.2732
[INFO] simulating digital twin on i 53, mission_id: 883
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0031 13.0025 0.2901
[INFO] simulating digital twin on i 53, mission_id: 883
[INFO] digital twin degradation parameters: 0.0031 13.0025 0.2901
[INFO] DigitalTwin mean parameter values: R0 = 0.00286 Q = 13.44 Req = 0.28522
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 53 mission_id: 883
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.23
[INFO] simulating true system on i: 54
[INFO] updating degradation parameter variance on i: 54
[INFO] updating degradation parameter values via random sampling on i: 54
[INFO] i: 54 mission_id: 884 rul_hat: 17.23 flight_time: 13.58 distance: 1020.98 R0: 0.00312 Q: 14.73 Req: 0.27708
[INFO] success on i: 54 mission_id: 884
[INFO] forecasting degradation values: r_mu: 0.003274 q_mu: 14.113024 m_mu: 0.279750
[INFO] digital twin degradation parameters: 0.0034 14.0084 0.2875
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.23
[INFO] simulating digital twin on i 54, mission_id: 884
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0030 13.9649 0.2752
[INFO] simulating digital twin on i 54, mission_id: 884
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0035 13.8251 0.2726
[INFO] simulating digital twin on i 54, mission_id: 884
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0035 13.9564 0.2822
[INFO] simulating digital twin on i 54, mission_id: 884
[INFO] digital twin degradation parameters: 0.0035 13.9564 0.2822
[INFO] DigitalTwin mean parameter values: R0 = 0.00335 Q = 13.94 Req = 0.27938
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 54 mission_id: 884
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 17.23
[INFO] simulating true system on i: 55
[INFO] updating degradation parameter variance on i: 55
[INFO] updating degradation parameter values via random sampling on i: 55
[INFO] i: 55 mission_id: 885 rul_hat: 17.23 flight_time: 13.58 distance: 1021.26 R0: 0.00323 Q: 14.15 Req: 0.25089
[INFO] success on i: 55 mission_id: 885
[INFO] forecasting degradation values: r_mu: 0.003893 q_mu: 14.532836 m_mu: 0.287585
[INFO] digital twin degradation parameters: 0.0041 15.2001 0.2943
[INFO] DigitalTwin selecting trajectory: <6> with path_time: 18.81 to explore constraint boundary < 17.23
[INFO] simulating digital twin on i 55, mission_id: 885

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[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0040 14.6208 0.2882
[INFO] simulating digital twin on i 55, mission_id: 885
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0035 14.4060 0.2864
[INFO] simulating digital twin on i 55, mission_id: 885
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0037 14.8341 0.3041
[INFO] simulating digital twin on i 55, mission_id: 885
[INFO] digital twin degradation parameters: 0.0037 14.8341 0.3041
[INFO] DigitalTwin mean parameter values: R0 = 0.00382 Q = 14.77 Req = 0.29327
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 55 mission_id: 885
trajectory <6> selected for TrueSystem
[INFO] new RUL update is available, 17.78 replaces 17.23
[INFO] simulating true system on i: 56
[INFO] updating degradation parameter variance on i: 56
[INFO] updating degradation parameter values via random sampling on i: 56
[INFO] i: 56 mission_id: 886 rul_hat: 17.78 flight_time: 14.83 distance: 1083.56 R0: 0.00286 Q: 14.48 Req: 0.27704
[INFO] success on i: 56 mission_id: 886
[INFO] forecasting degradation values: r_mu: 0.003601 q_mu: 13.657784 m_mu: 0.263250
[INFO] digital twin degradation parameters: 0.0029 14.3381 0.2565
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating digital twin on i 56, mission_id: 886
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0037 14.4613 0.2805
[INFO] simulating digital twin on i 56, mission_id: 886
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0037 12.9903 0.2610
[INFO] simulating digital twin on i 56, mission_id: 886
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0032 13.3901 0.2562
[INFO] simulating digital twin on i 56, mission_id: 886
[INFO] digital twin degradation parameters: 0.0032 13.3901 0.2562
[INFO] DigitalTwin mean parameter values: R0 = 0.00335 Q = 13.79 Req = 0.26352
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 56 mission_id: 886
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating true system on i: 57
[INFO] updating degradation parameter variance on i: 57
[INFO] updating degradation parameter values via random sampling on i: 57
[INFO] i: 57 mission_id: 887 rul_hat: 17.78 flight_time: 13.94 distance: 1047.76 R0: 0.00368 Q: 14.72 Req: 0.26461
[INFO] success on i: 57 mission_id: 887
[INFO] forecasting degradation values: r_mu: 0.003485 q_mu: 14.545867 m_mu: 0.293659
[INFO] digital twin degradation parameters: 0.0034 14.9425 0.3009
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating digital twin on i 57, mission_id: 887
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0039 14.4161 0.2962
[INFO] simulating digital twin on i 57, mission_id: 887
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0034 14.2399 0.2975
[INFO] simulating digital twin on i 57, mission_id: 887
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0035 14.4822 0.2954
[INFO] simulating digital twin on i 57, mission_id: 887
[INFO] digital twin degradation parameters: 0.0035 14.4822 0.2954
[INFO] DigitalTwin mean parameter values: R0 = 0.00352 Q = 14.52 Req = 0.29751
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 57 mission_id: 887
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating true system on i: 58
[INFO] updating degradation parameter variance on i: 58

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[INFO] updating degradation parameter values via random sampling on i: 58
[INFO] i: 58 mission_id: 888 rul_hat: 17.78 flight_time: 13.94 distance: 1047.69 R0: 0.00421 Q: 14.05 Req: 0.27071
[INFO] success on i: 58 mission_id: 888
[INFO] forecasting degradation values: r_mu: 0.004101 q_mu: 14.799678 m_mu: 0.284987
[INFO] digital twin degradation parameters: 0.0042 14.8166 0.2805
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating digital twin on i 58, mission_id: 888
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0038 15.2646 0.2819
[INFO] simulating digital twin on i 58, mission_id: 888
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0049 14.7415 0.2836
[INFO] simulating digital twin on i 58, mission_id: 888
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0037 14.5382 0.2795
[INFO] simulating digital twin on i 58, mission_id: 888
[INFO] digital twin degradation parameters: 0.0037 14.5382 0.2795
[INFO] DigitalTwin mean parameter values: R0 = 0.00416 Q = 14.84 Req = 0.28139
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 58 mission_id: 888
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating true system on i: 59
[INFO] updating degradation parameter variance on i: 59
[INFO] updating degradation parameter values via random sampling on i: 59
[INFO] i: 59 mission_id: 889 rul_hat: 17.78 flight_time: 13.94 distance: 1047.86 R0: 0.00408 Q: 14.41 Req: 0.27318
[INFO] success on i: 59 mission_id: 889
[INFO] forecasting degradation values: r_mu: 0.004518 q_mu: 14.955875 m_mu: 0.279462
[INFO] digital twin degradation parameters: 0.0049 15.3853 0.2657
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.78
[INFO] simulating digital twin on i 59, mission_id: 889
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0048 14.5383 0.2739
[INFO] simulating digital twin on i 59, mission_id: 889
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0049 14.9186 0.2825
[INFO] simulating digital twin on i 59, mission_id: 889
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0041 14.4331 0.2836
[INFO] simulating digital twin on i 59, mission_id: 889
[INFO] digital twin degradation parameters: 0.0041 14.4331 0.2836
[INFO] DigitalTwin mean parameter values: R0 = 0.00467 Q = 14.82 Req = 0.27645
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 59 mission_id: 889
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 17.78
[INFO] simulating true system on i: 60
[INFO] updating degradation parameter variance on i: 60
[INFO] updating degradation parameter values via random sampling on i: 60
[INFO] i: 60 mission_id: 890 rul_hat: 17.78 flight_time: 14.83 distance: 1083.71 R0: 0.00457 Q: 14.38 Req: 0.26293
[INFO] success on i: 60 mission_id: 890
[INFO] forecasting degradation values: r_mu: 0.004758 q_mu: 14.949018 m_mu: 0.277629
[INFO] digital twin degradation parameters: 0.0042 14.4921 0.2774
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating digital twin on i 60, mission_id: 890
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0042 14.4089 0.2787
[INFO] simulating digital twin on i 60, mission_id: 890
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0052 14.7001 0.2710
[INFO] simulating digital twin on i 60, mission_id: 890
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0047 14.4417 0.2777
[INFO] simulating digital twin on i 60, mission_id: 890
[INFO] digital twin degradation parameters: 0.0047 14.4417 0.2777

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[INFO] DigitalTwin mean parameter values: R0 = 0.00458 Q = 14.51 Req = 0.27621
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 60 mission_id: 890
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 17.78
[INFO] simulating true system on i: 61
[INFO] updating degradation parameter variance on i: 61
[INFO] updating degradation parameter values via random sampling on i: 61
[INFO] i: 61 mission_id: 891 rul_hat: 17.78 flight_time: 13.94 distance: 1047.66 R0: 0.00458 Q: 13.91 Req: 0.26212
[INFO] success on i: 61 mission_id: 891
[INFO] forecasting degradation values: r_mu: 0.005626 q_mu: 14.921784 m_mu: 0.271458
[INFO] digital twin degradation parameters: 0.0054 14.8312 0.2805
[INFO] DigitalTwin selecting trajectory: <20> with path_time: 19.65 to explore constraint boundary < 17.78
[INFO] simulating digital twin on i 61, mission_id: 891
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0061 14.6084 0.2697
[INFO] simulating digital twin on i 61, mission_id: 891
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0062 15.3725 0.2751
[INFO] simulating digital twin on i 61, mission_id: 891
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0058 14.7459 0.2752
[INFO] simulating digital twin on i 61, mission_id: 891
[INFO] digital twin degradation parameters: 0.0058 14.7459 0.2752
[INFO] DigitalTwin mean parameter values: R0 = 0.00589 Q = 14.89 Req = 0.27513
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 61 mission_id: 891
trajectory <20> selected for TrueSystem
[INFO] new RUL update is available, 18.64 replaces 17.78
[INFO] simulating true system on i: 62
[INFO] updating degradation parameter variance on i: 62
[INFO] updating degradation parameter values via random sampling on i: 62
[INFO] i: 62 mission_id: 892 rul_hat: 18.64 flight_time: 16.36 distance: 1218.82 R0: 0.00452 Q: 14.15 Req: 0.27035
[INFO] success on i: 62 mission_id: 892
[INFO] forecasting degradation values: r_mu: 0.005432 q_mu: 14.590740 m_mu: 0.267409
[INFO] digital twin degradation parameters: 0.0057 14.8208 0.2631
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 18.64
[INFO] simulating digital twin on i 62, mission_id: 892
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0055 14.5012 0.2696
[INFO] simulating digital twin on i 62, mission_id: 892
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0053 14.7193 0.2668
[INFO] simulating digital twin on i 62, mission_id: 892
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0054 14.7244 0.2739
[INFO] simulating digital twin on i 62, mission_id: 892
[INFO] digital twin degradation parameters: 0.0054 14.7244 0.2739
[INFO] DigitalTwin mean parameter values: R0 = 0.00548 Q = 14.69 Req = 0.26834
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 62 mission_id: 892
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 18.64
[INFO] simulating true system on i: 63
[INFO] updating degradation parameter variance on i: 63
[INFO] updating degradation parameter values via random sampling on i: 63
[INFO] i: 63 mission_id: 893 rul_hat: 18.64 flight_time: 14.83 distance: 1083.79 R0: 0.00476 Q: 14.26 Req: 0.26395
[INFO] success on i: 63 mission_id: 893
[INFO] forecasting degradation values: r_mu: 0.005603 q_mu: 14.302865 m_mu: 0.262510
[INFO] digital twin degradation parameters: 0.0054 14.3689 0.2588
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 18.64
[INFO] simulating digital twin on i 63, mission_id: 893
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0058 14.3839 0.2643
[INFO] simulating digital twin on i 63, mission_id: 893

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[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0053 14.1635 0.2620
[INFO] simulating digital twin on i 63, mission_id: 893
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0053 14.3958 0.2732
[INFO] simulating digital twin on i 63, mission_id: 893
[INFO] digital twin degradation parameters: 0.0053 14.3958 0.2732
[INFO] DigitalTwin mean parameter values: R0 = 0.00547 Q = 14.33 Req = 0.26456
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 63 mission_id: 893
trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 18.64
[INFO] simulating true system on i: 64
[INFO] updating degradation parameter variance on i: 64
[INFO] updating degradation parameter values via random sampling on i: 64
[INFO] i: 64 mission_id: 894 rul_hat: 18.64 flight_time: 16.36 distance: 1218.87 R0: 0.00460 Q: 13.94 Req: 0.26940
[INFO] success on i: 64 mission_id: 894
[INFO] forecasting degradation values: r_mu: 0.005776 q_mu: 14.250878 m_mu: 0.257160
[INFO] digital twin degradation parameters: 0.0063 13.9892 0.2580
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 18.64
[INFO] simulating digital twin on i 64, mission_id: 894
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0058 14.2390 0.2697
[INFO] simulating digital twin on i 64, mission_id: 894
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0055 14.2382 0.2686
[INFO] simulating digital twin on i 64, mission_id: 894
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0054 14.4002 0.2526
[INFO] simulating digital twin on i 64, mission_id: 894
[INFO] digital twin degradation parameters: 0.0054 14.4002 0.2526
[INFO] DigitalTwin mean parameter values: R0 = 0.00574 Q = 14.22 Req = 0.26222
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 64 mission_id: 894
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 18.64
[INFO] simulating true system on i: 65
[INFO] updating degradation parameter variance on i: 65
[INFO] updating degradation parameter values via random sampling on i: 65
[INFO] i: 65 mission_id: 895 rul_hat: 18.64 flight_time: 14.83 distance: 1083.70 R0: 0.00535 Q: 13.83 Req: 0.27712
[INFO] success on i: 65 mission_id: 895
[INFO] forecasting degradation values: r_mu: 0.005834 q_mu: 13.375523 m_mu: 0.261727
[INFO] digital twin degradation parameters: 0.0057 13.4393 0.2676
[INFO] DigitalTwin selecting trajectory: <3> with path_time: 17.83 that meets constraint: path_time < 18.64
[INFO] simulating digital twin on i 65, mission_id: 895
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0060 13.2053 0.2605
[INFO] simulating digital twin on i 65, mission_id: 895
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0053 13.1403 0.2601
[INFO] simulating digital twin on i 65, mission_id: 895
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0056 13.1502 0.2600
[INFO] simulating digital twin on i 65, mission_id: 895
[INFO] digital twin degradation parameters: 0.0056 13.1502 0.2600
[INFO] DigitalTwin mean parameter values: R0 = 0.00565 Q = 13.23 Req = 0.26208
stop code counts: low_soc: 3 pos_err: 0 success: 1
[WARN] DigitalTwin low soc threshold exceeded on i: 65 mission_id: 895
[INFO] updating RUL from 18.64 to 16.76
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 65, mission_id: 895
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0055 13.8482 0.2602
[INFO] simulating digital twin on i 65, mission_id: 895

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[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0053 13.2147 0.2655
[INFO] simulating digital twin on i 65, mission_id: 895
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0062 13.4172 0.2629
[INFO] simulating digital twin on i 65, mission_id: 895
[INFO] digital twin degradation parameters: 0.0062 13.4172 0.2629
[INFO] DigitalTwin mean parameter values: R0 = 0.00564 Q = 13.41 Req = 0.26215
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 65 mission_id: 895
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 66
[INFO] updating degradation parameter variance on i: 66
[INFO] updating degradation parameter values via random sampling on i: 66
[INFO] i: 66 mission_id: 896 rul_hat: 16.76 flight_time: 13.58 distance: 1021.24 R0: 0.00541 Q: 13.35 Req: 0.27305
[INFO] success on i: 66 mission_id: 896
[INFO] forecasting degradation values: r_mu: 0.006391 q_mu: 13.531652 m_mu: 0.263756
[INFO] digital twin degradation parameters: 0.0058 13.4194 0.2673
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 66, mission_id: 896
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0064 12.9925 0.2701
[INFO] simulating digital twin on i 66, mission_id: 896
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0068 13.3860 0.2646
[INFO] simulating digital twin on i 66, mission_id: 896
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0067 13.6278 0.2664
[INFO] simulating digital twin on i 66, mission_id: 896
[INFO] digital twin degradation parameters: 0.0067 13.6278 0.2664
[INFO] DigitalTwin mean parameter values: R0 = 0.00643 Q = 13.36 Req = 0.26709
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 66 mission_id: 896
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 67
[INFO] updating degradation parameter variance on i: 67
[INFO] updating degradation parameter values via random sampling on i: 67
[INFO] i: 67 mission_id: 897 rul_hat: 16.76 flight_time: 13.58 distance: 1021.22 R0: 0.00536 Q: 13.68 Req: 0.27627
[INFO] success on i: 67 mission_id: 897
[INFO] forecasting degradation values: r_mu: 0.006590 q_mu: 13.303741 m_mu: 0.282999
[INFO] digital twin degradation parameters: 0.0063 13.6453 0.2830
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 67, mission_id: 897
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0062 13.2819 0.2821
[INFO] simulating digital twin on i 67, mission_id: 897
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0070 13.4492 0.2849
[INFO] simulating digital twin on i 67, mission_id: 897
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0061 13.0715 0.2837
[INFO] simulating digital twin on i 67, mission_id: 897
[INFO] digital twin degradation parameters: 0.0061 13.0715 0.2837
[INFO] DigitalTwin mean parameter values: R0 = 0.00641 Q = 13.36 Req = 0.28343
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 67 mission_id: 897
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 68
[INFO] updating degradation parameter variance on i: 68
[INFO] updating degradation parameter values via random sampling on i: 68
[INFO] i: 68 mission_id: 898 rul_hat: 16.76 flight_time: 14.83 distance: 1083.82 R0: 0.00552 Q: 13.95 Req: 0.28105
[INFO] success on i: 68 mission_id: 898

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[INFO] forecasting degradation values: r_mu: 0.006699 q_mu: 13.107699 m_mu: 0.273633
[INFO] digital twin degradation parameters: 0.0065 13.3090 0.2782
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 68, mission_id: 898
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0070 13.1569 0.2765
[INFO] simulating digital twin on i 68, mission_id: 898
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0068 13.0123 0.2748
[INFO] simulating digital twin on i 68, mission_id: 898
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0067 13.0238 0.2794
[INFO] simulating digital twin on i 68, mission_id: 898
[INFO] digital twin degradation parameters: 0.0067 13.0238 0.2794
[INFO] DigitalTwin mean parameter values: R0 = 0.00676 Q = 13.13 Req = 0.27721
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 68 mission_id: 898
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 69
[INFO] updating degradation parameter variance on i: 69
[INFO] updating degradation parameter values via random sampling on i: 69
[INFO] i: 69 mission_id: 899 rul_hat: 16.76 flight_time: 13.58 distance: 1021.12 R0: 0.00594 Q: 14.23 Req: 0.27655
[INFO] success on i: 69 mission_id: 899
[INFO] forecasting degradation values: r_mu: 0.006529 q_mu: 13.117241 m_mu: 0.283457
[INFO] digital twin degradation parameters: 0.0067 13.4654 0.2916
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 69, mission_id: 899
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0068 12.8269 0.2826
[INFO] simulating digital twin on i 69, mission_id: 899
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0066 13.4449 0.2878
[INFO] simulating digital twin on i 69, mission_id: 899
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0065 13.3205 0.2825
[INFO] simulating digital twin on i 69, mission_id: 899
[INFO] digital twin degradation parameters: 0.0065 13.3205 0.2825
[INFO] DigitalTwin mean parameter values: R0 = 0.00666 Q = 13.26 Req = 0.28613
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 69 mission_id: 899
trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 70
[INFO] updating degradation parameter variance on i: 70
[INFO] updating degradation parameter values via random sampling on i: 70
[INFO] i: 70 mission_id: 900 rul_hat: 16.76 flight_time: 16.36 distance: 1218.79 R0: 0.00633 Q: 14.00 Req: 0.27861
[INFO] success on i: 70 mission_id: 900
[INFO] forecasting degradation values: r_mu: 0.006701 q_mu: 13.621611 m_mu: 0.283394
[INFO] digital twin degradation parameters: 0.0066 13.5166 0.2854
[INFO] DigitalTwin selecting trajectory: <15> with path_time: 17.63 to explore constraint boundary < 16.76
[INFO] simulating digital twin on i 70, mission_id: 900
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0067 13.6558 0.2817
[INFO] simulating digital twin on i 70, mission_id: 900
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0072 13.6058 0.2821
[INFO] simulating digital twin on i 70, mission_id: 900
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0074 13.7917 0.2854
[INFO] simulating digital twin on i 70, mission_id: 900
[INFO] digital twin degradation parameters: 0.0074 13.7917 0.2854
[INFO] DigitalTwin mean parameter values: R0 = 0.00698 Q = 13.64 Req = 0.28362
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 70 mission_id: 900

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trajectory <15> selected for TrueSystem
[INFO] simulating true system on i: 71
[INFO] updating degradation parameter variance on i: 71
[INFO] updating degradation parameter values via random sampling on i: 71
[INFO] i: 71 mission_id: 901 rul_hat: 16.76 flight_time: 13.94 distance: 1047.74 R0: 0.00655 Q: 13.35 Req: 0.27836
[INFO] success on i: 71 mission_id: 901
[INFO] forecasting degradation values: r_mu: 0.007191 q_mu: 13.566830 m_mu: 0.286662
[INFO] digital twin degradation parameters: 0.0071 13.6724 0.2841
[INFO] DigitalTwin selecting trajectory: <15> with path_time: 17.63 to explore constraint boundary < 16.76
[INFO] simulating digital twin on i 71, mission_id: 901
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0071 13.5651 0.2879
[INFO] simulating digital twin on i 71, mission_id: 901
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0076 13.6712 0.2877
[INFO] simulating digital twin on i 71, mission_id: 901
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0070 13.5205 0.2882
[INFO] simulating digital twin on i 71, mission_id: 901
[INFO] digital twin degradation parameters: 0.0070 13.5205 0.2882
[INFO] DigitalTwin mean parameter values: R0 = 0.00719 Q = 13.61 Req = 0.28698
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 71 mission_id: 901
trajectory <15> selected for TrueSystem
[INFO] simulating true system on i: 72
[INFO] updating degradation parameter variance on i: 72
[INFO] updating degradation parameter values via random sampling on i: 72
[INFO] i: 72 mission_id: 902 rul_hat: 16.76 flight_time: 17.62 distance: 1283.31 R0: 0.00632 Q: 13.65 Req: 0.27922
[WARN] true system low soc threshold exceeded on i: 72 mission_id: 902
[INFO] forecasting degradation values: r_mu: 0.007427 q_mu: 13.353776 m_mu: 0.291089
[INFO] digital twin degradation parameters: 0.0074 13.2990 0.2867
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 72, mission_id: 902
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0073 13.3831 0.2920
[INFO] simulating digital twin on i 72, mission_id: 902
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0074 13.3156 0.2913
[INFO] simulating digital twin on i 72, mission_id: 902
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0076 13.6742 0.2942
[INFO] simulating digital twin on i 72, mission_id: 902
[INFO] digital twin degradation parameters: 0.0076 13.6742 0.2942
[INFO] DigitalTwin mean parameter values: R0 = 0.00740 Q = 13.42 Req = 0.29102
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 72 mission_id: 902
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 73
[INFO] updating degradation parameter variance on i: 73
[INFO] updating degradation parameter values via random sampling on i: 73
[INFO] i: 73 mission_id: 903 rul_hat: 16.76 flight_time: 14.83 distance: 1083.72 R0: 0.00689 Q: 13.66 Req: 0.27922
[INFO] success on i: 73 mission_id: 903
[INFO] forecasting degradation values: r_mu: 0.007575 q_mu: 13.665133 m_mu: 0.290943
[INFO] digital twin degradation parameters: 0.0071 13.0783 0.2824
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 73, mission_id: 903
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0074 13.6753 0.2876
[INFO] simulating digital twin on i 73, mission_id: 903
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0074 13.8175 0.2949
[INFO] simulating digital twin on i 73, mission_id: 903
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0083 13.7407 0.2912

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[INFO] simulating digital twin on i 73, mission_id: 903
[INFO] digital twin degradation parameters: 0.0083 13.7407 0.2912
[INFO] DigitalTwin mean parameter values: R0 = 0.00753 Q = 13.58 Req = 0.28903
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 73 mission_id: 903
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 74
[INFO] updating degradation parameter variance on i: 74
[INFO] updating degradation parameter values via random sampling on i: 74
[INFO] i: 74 mission_id: 904 rul_hat: 16.76 flight_time: 14.83 distance: 1083.86 R0: 0.00712 Q: 13.43 Req: 0.28096
[INFO] success on i: 74 mission_id: 904
[INFO] forecasting degradation values: r_mu: 0.008138 q_mu: 13.532814 m_mu: 0.286428
[INFO] digital twin degradation parameters: 0.0077 13.4685 0.2902
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 74, mission_id: 904
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0084 13.8021 0.2903
[INFO] simulating digital twin on i 74, mission_id: 904
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0075 13.3917 0.2909
[INFO] simulating digital twin on i 74, mission_id: 904
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0082 13.5340 0.2886
[INFO] simulating digital twin on i 74, mission_id: 904
[INFO] digital twin degradation parameters: 0.0082 13.5340 0.2886
[INFO] DigitalTwin mean parameter values: R0 = 0.00796 Q = 13.55 Req = 0.29001
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 74 mission_id: 904
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 75
[INFO] updating degradation parameter variance on i: 75
[INFO] updating degradation parameter values via random sampling on i: 75
[INFO] i: 75 mission_id: 905 rul_hat: 16.76 flight_time: 13.94 distance: 1047.68 R0: 0.00789 Q: 13.49 Req: 0.27819
[INFO] success on i: 75 mission_id: 905
[INFO] forecasting degradation values: r_mu: 0.008368 q_mu: 13.332802 m_mu: 0.290395
[INFO] digital twin degradation parameters: 0.0083 13.2809 0.2949
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 75, mission_id: 905
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0084 13.2422 0.2907
[INFO] simulating digital twin on i 75, mission_id: 905
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0084 12.9833 0.2913
[INFO] simulating digital twin on i 75, mission_id: 905
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0086 13.3053 0.2983
[INFO] simulating digital twin on i 75, mission_id: 905
[INFO] digital twin degradation parameters: 0.0086 13.3053 0.2983
[INFO] DigitalTwin mean parameter values: R0 = 0.00844 Q = 13.20 Req = 0.29378
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 75 mission_id: 905
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 76
[INFO] updating degradation parameter variance on i: 76
[INFO] updating degradation parameter values via random sampling on i: 76
[INFO] i: 76 mission_id: 906 rul_hat: 16.76 flight_time: 13.94 distance: 1047.71 R0: 0.00808 Q: 13.31 Req: 0.28199
[INFO] success on i: 76 mission_id: 906
[INFO] forecasting degradation values: r_mu: 0.009143 q_mu: 13.429337 m_mu: 0.285658
[INFO] digital twin degradation parameters: 0.0091 13.4896 0.2894
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 76, mission_id: 906
[INFO] resampling for twin run # 2

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[INFO] digital twin degradation parameters: 0.0096 13.6622 0.2898
[INFO] simulating digital twin on i 76, mission_id: 906
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0089 13.2958 0.2869
[INFO] simulating digital twin on i 76, mission_id: 906
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0091 13.0231 0.2781
[INFO] simulating digital twin on i 76, mission_id: 906
[INFO] digital twin degradation parameters: 0.0091 13.0231 0.2781
[INFO] DigitalTwin mean parameter values: R0 = 0.00918 Q = 13.37 Req = 0.28604
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 76 mission_id: 906
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 77
[INFO] updating degradation parameter variance on i: 77
[INFO] updating degradation parameter values via random sampling on i: 77
[INFO] i: 77 mission_id: 907 rul_hat: 16.76 flight_time: 13.94 distance: 1047.81 R0: 0.00855 Q: 13.14 Req: 0.29394
[INFO] success on i: 77 mission_id: 907
[INFO] forecasting degradation values: r_mu: 0.009321 q_mu: 13.204034 m_mu: 0.283685
[INFO] digital twin degradation parameters: 0.0088 13.3162 0.2837
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 77, mission_id: 907
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0091 13.4190 0.2840
[INFO] simulating digital twin on i 77, mission_id: 907
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0089 12.5978 0.2823
[INFO] simulating digital twin on i 77, mission_id: 907
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0096 13.2493 0.2840
[INFO] simulating digital twin on i 77, mission_id: 907
[INFO] digital twin degradation parameters: 0.0096 13.2493 0.2840
[INFO] DigitalTwin mean parameter values: R0 = 0.00911 Q = 13.15 Req = 0.28348
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 77 mission_id: 907
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 78
[INFO] updating degradation parameter variance on i: 78
[INFO] updating degradation parameter values via random sampling on i: 78
[INFO] i: 78 mission_id: 908 rul_hat: 16.76 flight_time: 13.94 distance: 1047.87 R0: 0.00884 Q: 12.95 Req: 0.29146
[INFO] success on i: 78 mission_id: 908
[INFO] forecasting degradation values: r_mu: 0.010008 q_mu: 12.853773 m_mu: 0.293886
[INFO] digital twin degradation parameters: 0.0098 12.8632 0.2921
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 78, mission_id: 908
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0104 12.9902 0.3039
[INFO] simulating digital twin on i 78, mission_id: 908
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0103 12.8566 0.2892
[INFO] simulating digital twin on i 78, mission_id: 908
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0096 12.8580 0.2950
[INFO] simulating digital twin on i 78, mission_id: 908
[INFO] digital twin degradation parameters: 0.0096 12.8580 0.2950
[INFO] DigitalTwin mean parameter values: R0 = 0.01003 Q = 12.89 Req = 0.29504
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 78 mission_id: 908
trajectory <11> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <11> with path_time: 16.38 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 79
[INFO] updating degradation parameter variance on i: 79
[INFO] updating degradation parameter values via random sampling on i: 79

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[INFO] i: 79 mission_id: 909 rul_hat: 16.76 flight_time: 16.37 distance: 1218.98 R0: 0.00931 Q: 13.03 Req: 0.28910
[INFO] success on i: 79 mission_id: 909
[INFO] forecasting degradation values: r_mu: 0.010594 q_mu: 12.607813 m_mu: 0.292115
[INFO] digital twin degradation parameters: 0.0106 12.4144 0.2960
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 79, mission_id: 909
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0110 12.7601 0.2916
[INFO] simulating digital twin on i 79, mission_id: 909
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0107 12.6296 0.2930
[INFO] simulating digital twin on i 79, mission_id: 909
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0107 12.4569 0.2881
[INFO] simulating digital twin on i 79, mission_id: 909
[INFO] digital twin degradation parameters: 0.0107 12.4569 0.2881
[INFO] DigitalTwin mean parameter values: R0 = 0.01074 Q = 12.57 Req = 0.29217
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 79 mission_id: 909
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 80
[INFO] updating degradation parameter variance on i: 80
[INFO] updating degradation parameter values via random sampling on i: 80
[INFO] i: 80 mission_id: 910 rul_hat: 16.76 flight_time: 14.83 distance: 1083.80 R0: 0.00957 Q: 13.70 Req: 0.28440
[INFO] success on i: 80 mission_id: 910
[INFO] forecasting degradation values: r_mu: 0.011099 q_mu: 12.351768 m_mu: 0.293864
[INFO] digital twin degradation parameters: 0.0109 12.2921 0.2914
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 80, mission_id: 910
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0111 12.2032 0.2916
[INFO] simulating digital twin on i 80, mission_id: 910
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0108 12.1369 0.2868
[INFO] simulating digital twin on i 80, mission_id: 910
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0110 12.0805 0.2903
[INFO] simulating digital twin on i 80, mission_id: 910
[INFO] digital twin degradation parameters: 0.0110 12.0805 0.2903
[INFO] DigitalTwin mean parameter values: R0 = 0.01094 Q = 12.18 Req = 0.29005
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 80 mission_id: 910
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 81
[INFO] updating degradation parameter variance on i: 81
[INFO] updating degradation parameter values via random sampling on i: 81
[INFO] i: 81 mission_id: 911 rul_hat: 16.76 flight_time: 13.58 distance: 1021.24 R0: 0.00987 Q: 12.90 Req: 0.28664
[INFO] success on i: 81 mission_id: 911
[INFO] forecasting degradation values: r_mu: 0.011529 q_mu: 12.692821 m_mu: 0.295002
[INFO] digital twin degradation parameters: 0.0116 12.4520 0.3006
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 81, mission_id: 911
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0112 12.6067 0.2884
[INFO] simulating digital twin on i 81, mission_id: 911
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0114 12.5076 0.2891
[INFO] simulating digital twin on i 81, mission_id: 911
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0111 12.8341 0.3050
[INFO] simulating digital twin on i 81, mission_id: 911
[INFO] digital twin degradation parameters: 0.0111 12.8341 0.3050
[INFO] DigitalTwin mean parameter values: R0 = 0.01134 Q = 12.60 Req = 0.29576

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stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 81 mission_id: 911
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 82
[INFO] updating degradation parameter variance on i: 82
[INFO] updating degradation parameter values via random sampling on i: 82
[INFO] i: 82 mission_id: 912 rul_hat: 16.76 flight_time: 14.83 distance: 1083.71 R0: 0.01082 Q: 13.04 Req: 0.28732
[INFO] success on i: 82 mission_id: 912
[INFO] forecasting degradation values: r_mu: 0.011916 q_mu: 12.222534 m_mu: 0.296373
[INFO] digital twin degradation parameters: 0.0118 12.2415 0.2918
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating digital twin on i 82, mission_id: 912
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0117 11.7469 0.3082
[INFO] simulating digital twin on i 82, mission_id: 912
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0119 12.3235 0.3023
[INFO] simulating digital twin on i 82, mission_id: 912
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0116 12.3258 0.2989
[INFO] simulating digital twin on i 82, mission_id: 912
[INFO] digital twin degradation parameters: 0.0116 12.3258 0.2989
[INFO] DigitalTwin mean parameter values: R0 = 0.01174 Q = 12.16 Req = 0.30031
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 82 mission_id: 912
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 16.76
[INFO] simulating true system on i: 83
[INFO] updating degradation parameter variance on i: 83
[INFO] updating degradation parameter values via random sampling on i: 83
[INFO] i: 83 mission_id: 913 rul_hat: 16.76 flight_time: 14.83 distance: 1083.74 R0: 0.01089 Q: 13.17 Req: 0.28573
[INFO] success on i: 83 mission_id: 913
[INFO] forecasting degradation values: r_mu: 0.012807 q_mu: 12.520822 m_mu: 0.296445
[INFO] digital twin degradation parameters: 0.0129 12.3083 0.2925
[INFO] DigitalTwin selecting trajectory: <15> with path_time: 17.63 to explore constraint boundary < 16.76
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0127 12.3946 0.2985
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0130 12.7628 0.2978
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0127 12.6783 0.2960
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] digital twin degradation parameters: 0.0127 12.6783 0.2960
[INFO] DigitalTwin mean parameter values: R0 = 0.01284 Q = 12.54 Req = 0.29620
stop code counts: low_soc: 4 pos_err: 0 success: 0
[WARN] DigitalTwin low soc threshold exceeded on i: 83 mission_id: 913
[INFO] updating RUL from 16.76 to 15.79
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <15> with path_time: 17.63 to explore constraint boundary < 15.79
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0128 12.8433 0.2940
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0127 12.2874 0.2951
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0128 12.5550 0.2920
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] digital twin degradation parameters: 0.0128 12.5550 0.2920
[INFO] DigitalTwin mean parameter values: R0 = 0.01275 Q = 12.59 Req = 0.29428

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stop code counts: low_soc: 4 pos_err: 0 success: 0
[WARN] DigitalTwin low soc threshold exceeded on i: 83 mission_id: 913
[INFO] updating RUL from 15.79 to 15.82
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0127 12.3113 0.2950
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0134 13.3727 0.3022
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0129 12.2013 0.2935
[INFO] simulating digital twin on i 83, mission_id: 913
[INFO] digital twin degradation parameters: 0.0129 12.2013 0.2935
[INFO] DigitalTwin mean parameter values: R0 = 0.01298 Q = 12.61 Req = 0.29569
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 83 mission_id: 913
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 84
[INFO] updating degradation parameter variance on i: 84
[INFO] updating degradation parameter values via random sampling on i: 84
[INFO] i: 84 mission_id: 914 rul_hat: 15.82 flight_time: 13.94 distance: 1047.71 R0: 0.01128 Q: 13.23 Req: 0.29161
[INFO] success on i: 84 mission_id: 914
[INFO] forecasting degradation values: r_mu: 0.013201 q_mu: 12.480039 m_mu: 0.294226
[INFO] digital twin degradation parameters: 0.0132 12.3950 0.2896
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 84, mission_id: 914
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0133 12.5253 0.2975
[INFO] simulating digital twin on i 84, mission_id: 914
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0133 12.0759 0.2943
[INFO] simulating digital twin on i 84, mission_id: 914
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0131 11.9715 0.2876
[INFO] simulating digital twin on i 84, mission_id: 914
[INFO] digital twin degradation parameters: 0.0131 11.9715 0.2876
[INFO] DigitalTwin mean parameter values: R0 = 0.01323 Q = 12.24 Req = 0.29225
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 84 mission_id: 914
trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 85
[INFO] updating degradation parameter variance on i: 85
[INFO] updating degradation parameter values via random sampling on i: 85
[INFO] i: 85 mission_id: 915 rul_hat: 15.82 flight_time: 13.47 distance: 994.84 R0: 0.01187 Q: 13.26 Req: 0.28888
[INFO] success on i: 85 mission_id: 915
[INFO] forecasting degradation values: r_mu: 0.013581 q_mu: 12.626984 m_mu: 0.296264
[INFO] digital twin degradation parameters: 0.0136 12.4025 0.2855
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 85, mission_id: 915
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0138 13.0608 0.2944
[INFO] simulating digital twin on i 85, mission_id: 915
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0138 12.8654 0.2892
[INFO] simulating digital twin on i 85, mission_id: 915
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0136 12.6923 0.2989
[INFO] simulating digital twin on i 85, mission_id: 915
[INFO] digital twin degradation parameters: 0.0136 12.6923 0.2989
[INFO] DigitalTwin mean parameter values: R0 = 0.01368 Q = 12.76 Req = 0.29199

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stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 85 mission_id: 915
      trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 86
[INFO] updating degradation parameter variance on i: 86
[INFO] updating degradation parameter values via random sampling on i: 86
[INFO] i: 86 mission_id: 916 rul_hat: 15.82 flight_time: 13.94 distance: 1047.83 R0: 0.01259 Q: 13.19 Req: 0.29426
[INFO] success on i: 86 mission_id: 916
[INFO] forecasting degradation values: r_mu: 0.014167 q_mu: 12.977499 m_mu: 0.294117
[INFO] digital twin degradation parameters: 0.0141 13.0723 0.2829
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 86, mission_id: 916
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0141 13.0594 0.3017
[INFO] simulating digital twin on i 86, mission_id: 916
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0140 12.7377 0.2917
[INFO] simulating digital twin on i 86, mission_id: 916
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0142 12.9263 0.2892
[INFO] simulating digital twin on i 86, mission_id: 916
[INFO] digital twin degradation parameters: 0.0142 12.9263 0.2892
[INFO] DigitalTwin mean parameter values: R0 = 0.01411 Q = 12.95 Req = 0.29135
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 86 mission_id: 916
      trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 87
[INFO] updating degradation parameter variance on i: 87
[INFO] updating degradation parameter values via random sampling on i: 87
[INFO] i: 87 mission_id: 917 rul_hat: 15.82 flight_time: 13.47 distance: 994.75 R0: 0.01286 Q: 12.89 Req: 0.29061
[INFO] success on i: 87 mission_id: 917
[INFO] forecasting degradation values: r_mu: 0.014719 q_mu: 13.025695 m_mu: 0.297520
[INFO] digital twin degradation parameters: 0.0146 12.9602 0.2920
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 87, mission_id: 917
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0147 13.1930 0.2933
[INFO] simulating digital twin on i 87, mission_id: 917
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0147 13.0986 0.2944
[INFO] simulating digital twin on i 87, mission_id: 917
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0147 13.1287 0.2928
[INFO] simulating digital twin on i 87, mission_id: 917
[INFO] digital twin degradation parameters: 0.0147 13.1287 0.2928
[INFO] DigitalTwin mean parameter values: R0 = 0.01470 Q = 13.10 Req = 0.29315
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 87 mission_id: 917
      trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 88
[INFO] updating degradation parameter variance on i: 88
[INFO] updating degradation parameter values via random sampling on i: 88
[INFO] i: 88 mission_id: 918 rul_hat: 15.82 flight_time: 14.83 distance: 1083.90 R0: 0.01381 Q: 13.22 Req: 0.29417
[INFO] success on i: 88 mission_id: 918
[INFO] forecasting degradation values: r_mu: 0.015314 q_mu: 12.986806 m_mu: 0.293325
[INFO] digital twin degradation parameters: 0.0153 12.6957 0.2958
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 88, mission_id: 918
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0154 13.0530 0.2914
[INFO] simulating digital twin on i 88, mission_id: 918
[INFO] resampling for twin run # 3

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[INFO] digital twin degradation parameters: 0.0150 12.6879 0.2952
[INFO] simulating digital twin on i 88, mission_id: 918
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0156 13.1719 0.2949
[INFO] simulating digital twin on i 88, mission_id: 918
[INFO] digital twin degradation parameters: 0.0156 13.1719 0.2949
[INFO] DigitalTwin mean parameter values: R0 = 0.01534 Q = 12.90 Req = 0.29429
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 88 mission_id: 918
trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 89
[INFO] updating degradation parameter variance on i: 89
[INFO] updating degradation parameter values via random sampling on i: 89
[INFO] i: 89 mission_id: 919 rul_hat: 15.82 flight_time: 13.47 distance: 994.82 R0: 0.01429 Q: 12.94 Req: 0.29823
[INFO] success on i: 89 mission_id: 919
[INFO] forecasting degradation values: r_mu: 0.016355 q_mu: 13.329112 m_mu: 0.292327
[INFO] digital twin degradation parameters: 0.0163 13.8021 0.2862
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 89, mission_id: 919
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0161 13.4705 0.2927
[INFO] simulating digital twin on i 89, mission_id: 919
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0164 13.5278 0.2975
[INFO] simulating digital twin on i 89, mission_id: 919
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0165 13.2119 0.2921
[INFO] simulating digital twin on i 89, mission_id: 919
[INFO] digital twin degradation parameters: 0.0165 13.2119 0.2921
[INFO] DigitalTwin mean parameter values: R0 = 0.01632 Q = 13.50 Req = 0.29215
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 89 mission_id: 919
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 90
[INFO] updating degradation parameter variance on i: 90
[INFO] updating degradation parameter values via random sampling on i: 90
[INFO] i: 90 mission_id: 920 rul_hat: 15.82 flight_time: 13.30 distance: 982.78 R0: 0.01508 Q: 12.56 Req: 0.28911
[WARN] true system position error threshold exceeded on i: 90 mission_id: 920
[INFO] forecasting degradation values: r_mu: 0.017116 q_mu: 13.217560 m_mu: 0.298709
[INFO] digital twin degradation parameters: 0.0171 13.2370 0.3077
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 90, mission_id: 920
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0170 13.6010 0.3124
[INFO] simulating digital twin on i 90, mission_id: 920
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0171 13.0978 0.2916
[INFO] simulating digital twin on i 90, mission_id: 920
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0172 13.2900 0.3045
[INFO] simulating digital twin on i 90, mission_id: 920
[INFO] digital twin degradation parameters: 0.0172 13.2900 0.3045
[INFO] DigitalTwin mean parameter values: R0 = 0.01712 Q = 13.31 Req = 0.30406
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 90 mission_id: 920
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 91
[INFO] updating degradation parameter variance on i: 91
[INFO] updating degradation parameter values via random sampling on i: 91
[INFO] i: 91 mission_id: 921 rul_hat: 15.82 flight_time: 13.94 distance: 1047.78 R0: 0.01568 Q: 12.89 Req: 0.29189
[INFO] success on i: 91 mission_id: 921
[INFO] forecasting degradation values: r_mu: 0.017936 q_mu: 12.954963 m_mu: 0.297853

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[INFO] digital twin degradation parameters: 0.0181 12.8172 0.2974
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 91, mission_id: 921
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0180 12.7039 0.2947
[INFO] simulating digital twin on i 91, mission_id: 921
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0178 13.0814 0.2995
[INFO] simulating digital twin on i 91, mission_id: 921
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0178 12.4783 0.2977
[INFO] simulating digital twin on i 91, mission_id: 921
[INFO] digital twin degradation parameters: 0.0178 12.4783 0.2977
[INFO] DigitalTwin mean parameter values: R0 = 0.01791 Q = 12.77 Req = 0.29732
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 91 mission_id: 921
trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 92
[INFO] updating degradation parameter variance on i: 92
[INFO] updating degradation parameter values via random sampling on i: 92
[INFO] i: 92 mission_id: 922 rul_hat: 15.82 flight_time: 13.47 distance: 994.85 R0: 0.01660 Q: 12.83 Req: 0.28832
[INFO] success on i: 92 mission_id: 922
[INFO] forecasting degradation values: r_mu: 0.018834 q_mu: 12.545629 m_mu: 0.298974
[INFO] digital twin degradation parameters: 0.0187 12.7624 0.2982
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 92, mission_id: 922
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0188 12.5795 0.3011
[INFO] simulating digital twin on i 92, mission_id: 922
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0189 12.3320 0.3008
[INFO] simulating digital twin on i 92, mission_id: 922
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0191 12.1674 0.3011
[INFO] simulating digital twin on i 92, mission_id: 922
[INFO] digital twin degradation parameters: 0.0191 12.1674 0.3011
[INFO] DigitalTwin mean parameter values: R0 = 0.01886 Q = 12.46 Req = 0.30030
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 92 mission_id: 922
trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 93
[INFO] updating degradation parameter variance on i: 93
[INFO] updating degradation parameter values via random sampling on i: 93
[INFO] i: 93 mission_id: 923 rul_hat: 15.82 flight_time: 13.47 distance: 994.75 R0: 0.01730 Q: 12.54 Req: 0.29276
[INFO] success on i: 93 mission_id: 923
[INFO] forecasting degradation values: r_mu: 0.019866 q_mu: 12.794797 m_mu: 0.295480
[INFO] digital twin degradation parameters: 0.0199 13.3737 0.2915
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 93, mission_id: 923
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0201 12.9310 0.2948
[INFO] simulating digital twin on i 93, mission_id: 923
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0199 12.7934 0.3010
[INFO] simulating digital twin on i 93, mission_id: 923
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0198 12.5144 0.2967
[INFO] simulating digital twin on i 93, mission_id: 923
[INFO] digital twin degradation parameters: 0.0198 12.5144 0.2967
[INFO] DigitalTwin mean parameter values: R0 = 0.01994 Q = 12.90 Req = 0.29601
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 93 mission_id: 923
trajectory <14> selected for TrueSystem

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[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 94
[INFO] updating degradation parameter variance on i: 94
[INFO] updating degradation parameter values via random sampling on i: 94
[INFO] i: 94 mission_id: 924 rul_hat: 15.82 flight_time: 14.83 distance: 1083.86 R0: 0.01833 Q: 12.36 Req: 0.29660
[INFO] success on i: 94 mission_id: 924
[INFO] forecasting degradation values: r_mu: 0.020648 q_mu: 12.451724 m_mu: 0.295353
[INFO] digital twin degradation parameters: 0.0207 11.9717 0.2985
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 94, mission_id: 924
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0206 12.4499 0.2958
[INFO] simulating digital twin on i 94, mission_id: 924
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0207 12.6176 0.2936
[INFO] simulating digital twin on i 94, mission_id: 924
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0208 12.4390 0.2913
[INFO] simulating digital twin on i 94, mission_id: 924
[INFO] digital twin degradation parameters: 0.0208 12.4390 0.2913
[INFO] DigitalTwin mean parameter values: R0 = 0.02072 Q = 12.37 Req = 0.29480
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 94 mission_id: 924
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 95
[INFO] updating degradation parameter variance on i: 95
[INFO] updating degradation parameter values via random sampling on i: 95
[INFO] i: 95 mission_id: 925 rul_hat: 15.82 flight_time: 13.30 distance: 982.82 R0: 0.01901 Q: 12.83 Req: 0.29969
[WARN] true system position error threshold exceeded on i: 95 mission_id: 925
[INFO] forecasting degradation values: r_mu: 0.021937 q_mu: 12.098734 m_mu: 0.296949
[INFO] digital twin degradation parameters: 0.0220 12.1160 0.3094
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 95, mission_id: 925
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0219 12.1210 0.3042
[INFO] simulating digital twin on i 95, mission_id: 925
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0220 12.0700 0.2973
[INFO] simulating digital twin on i 95, mission_id: 925
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0220 11.9264 0.2992
[INFO] simulating digital twin on i 95, mission_id: 925
[INFO] digital twin degradation parameters: 0.0220 11.9264 0.2992
[INFO] DigitalTwin mean parameter values: R0 = 0.02198 Q = 12.06 Req = 0.30253
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 95 mission_id: 925
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 96
[INFO] updating degradation parameter variance on i: 96
[INFO] updating degradation parameter values via random sampling on i: 96
[INFO] i: 96 mission_id: 926 rul_hat: 15.82 flight_time: 14.83 distance: 1083.92 R0: 0.01982 Q: 12.55 Req: 0.29491
[INFO] success on i: 96 mission_id: 926
[INFO] forecasting degradation values: r_mu: 0.022985 q_mu: 12.222124 m_mu: 0.298258
[INFO] digital twin degradation parameters: 0.0229 12.2928 0.2926
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.82
[INFO] simulating digital twin on i 96, mission_id: 926
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0228 12.1842 0.3041
[INFO] simulating digital twin on i 96, mission_id: 926
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0230 12.1636 0.2930
[INFO] simulating digital twin on i 96, mission_id: 926
[INFO] resampling for twin run # 4

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[INFO] digital twin degradation parameters: 0.0231 12.1598 0.3047
[INFO] simulating digital twin on i 96, mission_id: 926
[INFO] digital twin degradation parameters: 0.0231 12.1598 0.3047
[INFO] DigitalTwin mean parameter values: R0 = 0.02295 Q = 12.20 Req = 0.29861
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 96 mission_id: 926
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.82
[INFO] simulating true system on i: 97
[INFO] updating degradation parameter variance on i: 97
[INFO] updating degradation parameter values via random sampling on i: 97
[INFO] i: 97 mission_id: 927 rul_hat: 15.82 flight_time: 14.83 distance: 1083.71 R0: 0.02099 Q: 12.46 Req: 0.30594
[INFO] success on i: 97 mission_id: 927
[INFO] forecasting degradation values: r_mu: 0.023974 q_mu: 12.088065 m_mu: 0.298180
[INFO] digital twin degradation parameters: 0.0241 12.0602 0.3047
[INFO] DigitalTwin selecting trajectory: <15> with path_time: 17.63 to explore constraint boundary < 15.82
[INFO] simulating digital twin on i 97, mission_id: 927
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0239 12.1892 0.2999
[INFO] simulating digital twin on i 97, mission_id: 927
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0241 12.0242 0.3018
[INFO] simulating digital twin on i 97, mission_id: 927
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0241 12.1325 0.2989
[INFO] simulating digital twin on i 97, mission_id: 927
[INFO] digital twin degradation parameters: 0.0241 12.1325 0.2989
[INFO] DigitalTwin mean parameter values: R0 = 0.02404 Q = 12.10 Req = 0.30133
stop code counts: low_soc: 4 pos_err: 0 success: 0
[WARN] DigitalTwin low soc threshold exceeded on i: 97 mission_id: 927
[INFO] updating RUL from 15.82 to 15.20
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 97, mission_id: 927
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0238 11.7770 0.2974
[INFO] simulating digital twin on i 97, mission_id: 927
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0238 12.6496 0.3019
[INFO] simulating digital twin on i 97, mission_id: 927
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0238 11.7994 0.2976
[INFO] simulating digital twin on i 97, mission_id: 927
[INFO] digital twin degradation parameters: 0.0238 11.7994 0.2976
[INFO] DigitalTwin mean parameter values: R0 = 0.02387 Q = 12.09 Req = 0.29897
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 97 mission_id: 927
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 98
[INFO] updating degradation parameter variance on i: 98
[INFO] updating degradation parameter values via random sampling on i: 98
[INFO] i: 98 mission_id: 928 rul_hat: 15.20 flight_time: 14.83 distance: 1083.96 R0: 0.02181 Q: 12.37 Req: 0.30691
[INFO] success on i: 98 mission_id: 928
[INFO] forecasting degradation values: r_mu: 0.025175 q_mu: 12.064826 m_mu: 0.304163
[INFO] digital twin degradation parameters: 0.0252 12.0480 0.2992
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 98, mission_id: 928
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0252 11.9518 0.3081
[INFO] simulating digital twin on i 98, mission_id: 928
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0253 12.3341 0.3040
[INFO] simulating digital twin on i 98, mission_id: 928
[INFO] resampling for twin run # 4

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[INFO] digital twin degradation parameters: 0.0251 11.7588 0.3048
[INFO] simulating digital twin on i 98, mission_id: 928
[INFO] digital twin degradation parameters: 0.0251 11.7588 0.3048
[INFO] DigitalTwin mean parameter values: R0 = 0.02520 Q = 12.02 Req = 0.30399
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 98 mission_id: 928
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 99
Bumping sigmax
[INFO] updating degradation parameter variance on i: 99
[INFO] updating degradation parameter values via random sampling on i: 99
[INFO] i: 99 mission_id: 929 rul_hat: 15.20 flight_time: 14.83 distance: 1084.02 R0: 0.02285 Q: 12.36 Req: 0.30151
[INFO] success on i: 99 mission_id: 929
[INFO] forecasting degradation values: r_mu: 0.026404 q_mu: 12.072128 m_mu: 0.310196
[INFO] digital twin degradation parameters: 0.0265 12.2881 0.3031
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 99, mission_id: 929
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0264 12.2953 0.3084
[INFO] simulating digital twin on i 99, mission_id: 929
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0263 12.1411 0.3125
[INFO] simulating digital twin on i 99, mission_id: 929
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0264 12.2712 0.3026
[INFO] simulating digital twin on i 99, mission_id: 929
[INFO] digital twin degradation parameters: 0.0264 12.2712 0.3026
[INFO] DigitalTwin mean parameter values: R0 = 0.02639 Q = 12.25 Req = 0.30665
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 99 mission_id: 929
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 100
Bumping sigmax
[INFO] updating degradation parameter variance on i: 100
[INFO] updating degradation parameter values via random sampling on i: 100
[INFO] i: 100 mission_id: 930 rul_hat: 15.20 flight_time: 13.30 distance: 982.82 R0: 0.02352 Q: 11.63 Req: 0.30592
[WARN] true system position error threshold exceeded on i: 100 mission_id: 930
[INFO] forecasting degradation values: r_mu: 0.027512 q_mu: 11.789795 m_mu: 0.309697
[INFO] digital twin degradation parameters: 0.0274 11.7265 0.3147
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 100, mission_id: 930
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0274 11.7297 0.3127
[INFO] simulating digital twin on i 100, mission_id: 930
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0274 11.7727 0.3136
[INFO] simulating digital twin on i 100, mission_id: 930
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0274 11.9571 0.3131
[INFO] simulating digital twin on i 100, mission_id: 930
[INFO] digital twin degradation parameters: 0.0274 11.9571 0.3131
[INFO] DigitalTwin mean parameter values: R0 = 0.02739 Q = 11.80 Req = 0.31354
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 100 mission_id: 930
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 101
Bumping sigmax
[INFO] updating degradation parameter variance on i: 101
[INFO] updating degradation parameter values via random sampling on i: 101
[INFO] i: 101 mission_id: 931 rul_hat: 15.20 flight_time: 13.94 distance: 1047.79 R0: 0.02470 Q: 11.98 Req: 0.30643
[INFO] success on i: 101 mission_id: 931
[INFO] forecasting degradation values: r_mu: 0.028587 q_mu: 11.590267 m_mu: 0.313318

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[INFO] digital twin degradation parameters: 0.0287 11.7350 0.3171
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 101, mission_id: 931
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0285 11.4499 0.3055
[INFO] simulating digital twin on i 101, mission_id: 931
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0287 11.6340 0.3183
[INFO] simulating digital twin on i 101, mission_id: 931
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0287 11.3060 0.3165
[INFO] simulating digital twin on i 101, mission_id: 931
[INFO] digital twin degradation parameters: 0.0287 11.3060 0.3165
[INFO] DigitalTwin mean parameter values: R0 = 0.02866 Q = 11.53 Req = 0.31438
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 101 mission_id: 931
trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 102
Bumping sigmax
[INFO] updating degradation parameter variance on i: 102
[INFO] updating degradation parameter values via random sampling on i: 102
[INFO] i: 102 mission_id: 932 rul_hat: 15.20 flight_time: 13.47 distance: 994.83 R0: 0.02539 Q: 12.54 Req: 0.31075
[INFO] success on i: 102 mission_id: 932
[INFO] forecasting degradation values: r_mu: 0.029757 q_mu: 11.813291 m_mu: 0.318715
[INFO] digital twin degradation parameters: 0.0298 11.6089 0.3181
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 102, mission_id: 932
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0299 12.3934 0.3208
[INFO] simulating digital twin on i 102, mission_id: 932
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0298 11.9666 0.3161
[INFO] simulating digital twin on i 102, mission_id: 932
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0299 11.7739 0.3118
[INFO] simulating digital twin on i 102, mission_id: 932
[INFO] digital twin degradation parameters: 0.0299 11.7739 0.3118
[INFO] DigitalTwin mean parameter values: R0 = 0.02984 Q = 11.94 Req = 0.31670
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 102 mission_id: 932
trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 103
Bumping sigmax
[INFO] updating degradation parameter variance on i: 103
[INFO] updating degradation parameter values via random sampling on i: 103
[INFO] i: 103 mission_id: 933 rul_hat: 15.20 flight_time: 13.47 distance: 994.81 R0: 0.02673 Q: 11.87 Req: 0.29695
[INFO] success on i: 103 mission_id: 933
[INFO] forecasting degradation values: r_mu: 0.030763 q_mu: 11.766974 m_mu: 0.321191
[INFO] digital twin degradation parameters: 0.0308 11.5292 0.3166
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 103, mission_id: 933
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0307 11.8350 0.3153
[INFO] simulating digital twin on i 103, mission_id: 933
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0306 11.2421 0.3192
[INFO] simulating digital twin on i 103, mission_id: 933
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0308 11.5914 0.3237
[INFO] simulating digital twin on i 103, mission_id: 933
[INFO] digital twin degradation parameters: 0.0308 11.5914 0.3237
[INFO] DigitalTwin mean parameter values: R0 = 0.03075 Q = 11.55 Req = 0.31873
stop code counts: low_soc: 0 pos_err: 0 success: 4

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[INFO] digital twin mission success on i: 103 mission_id: 933
      trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 104
Bumping sigmax
[INFO] updating degradation parameter variance on i: 104
[INFO] updating degradation parameter values via random sampling on i: 104
[INFO] i: 104 mission_id: 934 rul_hat: 15.20 flight_time: 13.94 distance: 1047.77 R0: 0.02771 Q: 12.46 Req: 0.31208
[INFO] success on i: 104 mission_id: 934
[INFO] forecasting degradation values: r_mu: 0.031957 q_mu: 11.432748 m_mu: 0.311666
[INFO] digital twin degradation parameters: 0.0319 11.2185 0.3119
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 104, mission_id: 934
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0321 11.4565 0.3095
[INFO] simulating digital twin on i 104, mission_id: 934
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0320 11.2687 0.3110
[INFO] simulating digital twin on i 104, mission_id: 934
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0319 11.4591 0.3173
[INFO] simulating digital twin on i 104, mission_id: 934
[INFO] digital twin degradation parameters: 0.0319 11.4591 0.3173
[INFO] DigitalTwin mean parameter values: R0 = 0.03197 Q = 11.35 Req = 0.31245
      stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 104 mission_id: 934
      trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 105
Bumping sigmax
[INFO] updating degradation parameter variance on i: 105
[INFO] updating degradation parameter values via random sampling on i: 105
[INFO] i: 105 mission_id: 935 rul_hat: 15.20 flight_time: 13.47 distance: 994.84 R0: 0.02872 Q: 12.45 Req: 0.30353
[INFO] success on i: 105 mission_id: 935
[INFO] forecasting degradation values: r_mu: 0.033133 q_mu: 11.872814 m_mu: 0.322841
[INFO] digital twin degradation parameters: 0.0332 11.6270 0.3248
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 105, mission_id: 935
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0332 12.0361 0.3203
[INFO] simulating digital twin on i 105, mission_id: 935
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0331 11.3599 0.3206
[INFO] simulating digital twin on i 105, mission_id: 935
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0330 12.1053 0.3274
[INFO] simulating digital twin on i 105, mission_id: 935
[INFO] digital twin degradation parameters: 0.0330 12.1053 0.3274
[INFO] DigitalTwin mean parameter values: R0 = 0.03311 Q = 11.78 Req = 0.32326
      stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 105 mission_id: 935
      trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 106
Bumping sigmax
[INFO] updating degradation parameter variance on i: 106
[INFO] updating degradation parameter values via random sampling on i: 106
[INFO] i: 106 mission_id: 936 rul_hat: 15.20 flight_time: 13.47 distance: 994.79 R0: 0.02972 Q: 12.03 Req: 0.30980
[INFO] success on i: 106 mission_id: 936
[INFO] forecasting degradation values: r_mu: 0.034249 q_mu: 12.081539 m_mu: 0.317039
[INFO] digital twin degradation parameters: 0.0344 12.4188 0.3148
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 106, mission_id: 936
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0343 12.2663 0.3215

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[INFO] simulating digital twin on i 106, mission_id: 936
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0341 12.2077 0.3127
[INFO] simulating digital twin on i 106, mission_id: 936
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0342 12.2785 0.3185
[INFO] simulating digital twin on i 106, mission_id: 936
[INFO] digital twin degradation parameters: 0.0342 12.2785 0.3185
[INFO] DigitalTwin mean parameter values: R0 = 0.03425 Q = 12.29 Req = 0.31690
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 106 mission_id: 936
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 107
Bumping sigmax
[INFO] updating degradation parameter variance on i: 107
[INFO] updating degradation parameter values via random sampling on i: 107
[INFO] i: 107 mission_id: 937 rul_hat: 15.20 flight_time: 13.94 distance: 1047.79 R0: 0.03079 Q: 12.22 Req: 0.31825
[INFO] success on i: 107 mission_id: 937
[INFO] forecasting degradation values: r_mu: 0.035442 q_mu: 11.822583 m_mu: 0.314211
[INFO] digital twin degradation parameters: 0.0354 11.4851 0.3084
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 107, mission_id: 937
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0355 11.3011 0.3154
[INFO] simulating digital twin on i 107, mission_id: 937
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0354 12.0975 0.3099
[INFO] simulating digital twin on i 107, mission_id: 937
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0354 11.5882 0.3108
[INFO] simulating digital twin on i 107, mission_id: 937
[INFO] digital twin degradation parameters: 0.0354 11.5882 0.3108
[INFO] DigitalTwin mean parameter values: R0 = 0.03542 Q = 11.62 Req = 0.31113
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 107 mission_id: 937
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 108
Bumping sigmax
[INFO] updating degradation parameter variance on i: 108
[INFO] updating degradation parameter values via random sampling on i: 108
[INFO] i: 108 mission_id: 938 rul_hat: 15.20 flight_time: 13.94 distance: 1047.96 R0: 0.03186 Q: 11.97 Req: 0.30845
[INFO] success on i: 108 mission_id: 938
[INFO] forecasting degradation values: r_mu: 0.036586 q_mu: 12.037912 m_mu: 0.320064
[INFO] digital twin degradation parameters: 0.0367 12.1754 0.3293
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 108, mission_id: 938
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0364 12.1975 0.3219
[INFO] simulating digital twin on i 108, mission_id: 938
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0365 12.2117 0.3245
[INFO] simulating digital twin on i 108, mission_id: 938
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0367 12.1429 0.3231
[INFO] simulating digital twin on i 108, mission_id: 938
[INFO] digital twin degradation parameters: 0.0367 12.1429 0.3231
[INFO] DigitalTwin mean parameter values: R0 = 0.03658 Q = 12.18 Req = 0.32470
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 108 mission_id: 938
trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 109
Bumping sigmax

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[INFO] updating degradation parameter variance on i: 109
[INFO] updating degradation parameter values via random sampling on i: 109
[INFO] i: 109 mission_id: 939 rul_hat: 15.20 flight_time: 13.47 distance: 994.85 R0: 0.03306 Q: 11.70 Req: 0.31074
[INFO] success on i: 109 mission_id: 939
[INFO] forecasting degradation values: r_mu: 0.037647 q_mu: 12.013310 m_mu: 0.313905
[INFO] digital twin degradation parameters: 0.0377 12.2510 0.3100
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 109, mission_id: 939
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0377 12.7569 0.3108
[INFO] simulating digital twin on i 109, mission_id: 939
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0378 12.2536 0.3111
[INFO] simulating digital twin on i 109, mission_id: 939
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0376 11.9595 0.3163
[INFO] simulating digital twin on i 109, mission_id: 939
[INFO] digital twin degradation parameters: 0.0376 11.9595 0.3163
[INFO] DigitalTwin mean parameter values: R0 = 0.03771 Q = 12.31 Req = 0.31203
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 109 mission_id: 939
trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 110
Bumping sigmax
[INFO] updating degradation parameter variance on i: 110
[INFO] updating degradation parameter values via random sampling on i: 110
[INFO] i: 110 mission_id: 940 rul_hat: 15.20 flight_time: 13.47 distance: 994.88 R0: 0.03452 Q: 11.46 Req: 0.32321
[INFO] success on i: 110 mission_id: 940
[INFO] forecasting degradation values: r_mu: 0.038933 q_mu: 11.836694 m_mu: 0.315166
[INFO] digital twin degradation parameters: 0.0390 11.6995 0.3145
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 110, mission_id: 940
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0391 12.1092 0.3134
[INFO] simulating digital twin on i 110, mission_id: 940
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0389 12.0201 0.3158
[INFO] simulating digital twin on i 110, mission_id: 940
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0390 11.6650 0.3175
[INFO] simulating digital twin on i 110, mission_id: 940
[INFO] digital twin degradation parameters: 0.0390 11.6650 0.3175
[INFO] DigitalTwin mean parameter values: R0 = 0.03901 Q = 11.87 Req = 0.31530
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 110 mission_id: 940
trajectory <10> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 111
Bumping sigmax
[INFO] updating degradation parameter variance on i: 111
[INFO] updating degradation parameter values via random sampling on i: 111
[INFO] i: 111 mission_id: 941 rul_hat: 15.20 flight_time: 13.25 distance: 974.53 R0: 0.03567 Q: 12.16 Req: 0.30739
[WARN] true system position error threshold exceeded on i: 111 mission_id: 941
[INFO] forecasting degradation values: r_mu: 0.040381 q_mu: 11.563023 m_mu: 0.324168
[INFO] digital twin degradation parameters: 0.0404 11.5764 0.3125
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 111, mission_id: 941
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0404 11.6348 0.3218
[INFO] simulating digital twin on i 111, mission_id: 941
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0404 11.4681 0.3237
[INFO] simulating digital twin on i 111, mission_id: 941
[INFO] resampling for twin run # 4

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[INFO] digital twin degradation parameters: 0.0405 11.3512 0.3213
[INFO] simulating digital twin on i 111, mission_id: 941
[INFO] digital twin degradation parameters: 0.0405 11.3512 0.3213
[INFO] DigitalTwin mean parameter values: R0 = 0.04043 Q = 11.51 Req = 0.31981
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 111 mission_id: 941
trajectory <14> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <14> with path_time: 14.81 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 112
Bumping sigmax
[INFO] updating degradation parameter variance on i: 112
[INFO] updating degradation parameter values via random sampling on i: 112
[INFO] i: 112 mission_id: 942 rul_hat: 15.20 flight_time: 14.83 distance: 1084.20 R0: 0.03700 Q: 11.73 Req: 0.32235
[INFO] success on i: 112 mission_id: 942
[INFO] forecasting degradation values: r_mu: 0.041796 q_mu: 11.920622 m_mu: 0.318006
[INFO] digital twin degradation parameters: 0.0420 11.6761 0.3148
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating digital twin on i 112, mission_id: 942
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0420 12.3296 0.3208
[INFO] simulating digital twin on i 112, mission_id: 942
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0419 11.8360 0.3218
[INFO] simulating digital twin on i 112, mission_id: 942
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0419 11.9560 0.3276
[INFO] simulating digital twin on i 112, mission_id: 942
[INFO] digital twin degradation parameters: 0.0419 11.9560 0.3276
[INFO] DigitalTwin mean parameter values: R0 = 0.04194 Q = 11.95 Req = 0.32127
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 112 mission_id: 942
trajectory <13> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <13> with path_time: 13.94 that meets constraint: path_time < 15.20
[INFO] simulating true system on i: 113
Bumping sigmax
[INFO] updating degradation parameter variance on i: 113
[INFO] updating degradation parameter values via random sampling on i: 113
[INFO] i: 113 mission_id: 943 rul_hat: 15.20 flight_time: 13.93 distance: 1047.74 R0: 0.03841 Q: 11.68 Req: 0.31804
[INFO] success on i: 113 mission_id: 943
[INFO] forecasting degradation values: r_mu: 0.043207 q_mu: 11.471441 m_mu: 0.324945
[INFO] digital twin degradation parameters: 0.0433 11.3719 0.3245
[INFO] DigitalTwin selecting trajectory: <11> with path_time: 16.38 to explore constraint boundary < 15.20
[INFO] simulating digital twin on i 113, mission_id: 943
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0433 11.6760 0.3329
[INFO] simulating digital twin on i 113, mission_id: 943
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0433 10.8551 0.3207
[INFO] simulating digital twin on i 113, mission_id: 943
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0433 11.5359 0.3348
[INFO] simulating digital twin on i 113, mission_id: 943
[INFO] digital twin degradation parameters: 0.0433 11.5359 0.3348
[INFO] DigitalTwin mean parameter values: R0 = 0.04328 Q = 11.36 Req = 0.32821
stop code counts: low_soc: 4 pos_err: 0 success: 0
[WARN] DigitalTwin low soc threshold exceeded on i: 113 mission_id: 943
[INFO] updating RUL from 15.20 to 14.37
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 14.37
[INFO] simulating digital twin on i 113, mission_id: 943
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0432 11.0843 0.3343
[INFO] simulating digital twin on i 113, mission_id: 943
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0432 11.0849 0.3271

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[INFO] simulating digital twin on i 113, mission_id: 943
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0432 11.3289 0.3274
[INFO] simulating digital twin on i 113, mission_id: 943
[INFO] digital twin degradation parameters: 0.0432 11.3289 0.3274
[INFO] DigitalTwin mean parameter values: R0 = 0.04323 Q = 11.26 Req = 0.33088
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 113 mission_id: 943
trajectory <9> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <9> with path_time: 13.45 that meets constraint: path_time < 14.37
[INFO] simulating true system on i: 114
Bumping sigmax
[INFO] updating degradation parameter variance on i: 114
[INFO] updating degradation parameter values via random sampling on i: 114
[INFO] i: 114 mission_id: 944 rul_hat: 14.37 flight_time: 13.47 distance: 994.88 R0: 0.03922 Q: 11.32 Req: 0.30847
[INFO] success on i: 114 mission_id: 944
[INFO] forecasting degradation values: r_mu: 0.045019 q_mu: 11.070273 m_mu: 0.326343
[INFO] digital twin degradation parameters: 0.0450 10.9135 0.3285
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 14.37
[INFO] simulating digital twin on i 114, mission_id: 944
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0449 11.5227 0.3258
[INFO] simulating digital twin on i 114, mission_id: 944
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0451 11.1940 0.3309
[INFO] simulating digital twin on i 114, mission_id: 944
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0449 11.3847 0.3336
[INFO] simulating digital twin on i 114, mission_id: 944
[INFO] digital twin degradation parameters: 0.0449 11.3847 0.3336
[INFO] DigitalTwin mean parameter values: R0 = 0.04497 Q = 11.25 Req = 0.32970
stop code counts: low_soc: 0 pos_err: 3 success: 1
[WARN] DigitalTwin position error threshold exceeded on i: 114 mission_id: 944
[INFO] updating RUL from 14.37 to 12.37
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <16> with path_time: 6.38 that meets constraint: path_time < 12.37
[INFO] simulating digital twin on i 114, mission_id: 944
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0450 11.1094 0.3221
[INFO] simulating digital twin on i 114, mission_id: 944
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0450 11.2195 0.3276
[INFO] simulating digital twin on i 114, mission_id: 944
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0450 10.7479 0.3266
[INFO] simulating digital twin on i 114, mission_id: 944
[INFO] digital twin degradation parameters: 0.0450 10.7479 0.3266
[INFO] DigitalTwin mean parameter values: R0 = 0.04498 Q = 11.12 Req = 0.32747
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 114 mission_id: 944
trajectory <16> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <16> with path_time: 6.38 that meets constraint: path_time < 12.37
[INFO] simulating true system on i: 115
Bumping sigmax
[INFO] updating degradation parameter variance on i: 115
[INFO] updating degradation parameter values via random sampling on i: 115
[INFO] i: 115 mission_id: 945 rul_hat: 12.37 flight_time: 6.37 distance: 481.21 R0: 0.04064 Q: 11.28 Req: 0.31801
[INFO] success on i: 115 mission_id: 945
[INFO] forecasting degradation values: r_mu: 0.046035 q_mu: 11.090066 m_mu: 0.324357
[INFO] digital twin degradation parameters: 0.0460 11.1381 0.3293
[INFO] DigitalTwin selecting trajectory: <19> with path_time: 4.33 that meets constraint: path_time < 12.37
[INFO] simulating digital twin on i 115, mission_id: 945
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0460 10.8739 0.3239
[INFO] simulating digital twin on i 115, mission_id: 945

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[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0462 11.4160 0.3237
[INFO] simulating digital twin on i 115, mission_id: 945
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0460 10.7099 0.3277
[INFO] simulating digital twin on i 115, mission_id: 945
[INFO] digital twin degradation parameters: 0.0460 10.7099 0.3277
[INFO] DigitalTwin mean parameter values: R0 = 0.04603 Q = 11.03 Req = 0.32616
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 115 mission_id: 945
trajectory <19> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <19> with path_time: 4.33 that meets constraint: path_time < 12.37
[INFO] simulating true system on i: 116
Bumping sigmax
[INFO] updating degradation parameter variance on i: 116
[INFO] updating degradation parameter values via random sampling on i: 116
[INFO] i: 116 mission_id: 946 rul_hat: 12.37 flight_time: 4.25 distance: 296.65 R0: 0.04228 Q: 11.25 Req: 0.31769
[INFO] success on i: 116 mission_id: 946
[INFO] forecasting degradation values: r_mu: 0.047905 q_mu: 10.631361 m_mu: 0.321444
[INFO] digital twin degradation parameters: 0.0477 10.7389 0.3206
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 to explore constraint boundary < 12.37
[INFO] simulating digital twin on i 116, mission_id: 946
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0480 10.6673 0.3219
[INFO] simulating digital twin on i 116, mission_id: 946
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0480 10.9297 0.3161
[INFO] simulating digital twin on i 116, mission_id: 946
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0480 10.3289 0.3161
[INFO] simulating digital twin on i 116, mission_id: 946
[INFO] digital twin degradation parameters: 0.0480 10.3289 0.3161
[INFO] DigitalTwin mean parameter values: R0 = 0.04793 Q = 10.67 Req = 0.31865
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 116 mission_id: 946
trajectory <13> selected for TrueSystem
[INFO] new RUL update is available, 12.95 replaces 12.37
[INFO] simulating true system on i: 117
Bumping sigmax
[INFO] updating degradation parameter variance on i: 117
[INFO] updating degradation parameter values via random sampling on i: 117
[INFO] i: 117 mission_id: 947 rul_hat: 12.95 flight_time: 6.02 distance: 433.63 R0: 0.04321 Q: 11.57 Req: 0.32249
[INFO] success on i: 117 mission_id: 947
[INFO] forecasting degradation values: r_mu: 0.049342 q_mu: 10.543831 m_mu: 0.324414
[INFO] digital twin degradation parameters: 0.0494 10.6825 0.3185
[INFO] DigitalTwin selecting trajectory: <13> with path_time: 13.94 to explore constraint boundary < 12.95
[INFO] simulating digital twin on i 117, mission_id: 947
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0494 10.2980 0.3247
[INFO] simulating digital twin on i 117, mission_id: 947
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0494 10.7974 0.3240
[INFO] simulating digital twin on i 117, mission_id: 947
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0492 10.2696 0.3255
[INFO] simulating digital twin on i 117, mission_id: 947
[INFO] digital twin degradation parameters: 0.0492 10.2696 0.3255
[INFO] DigitalTwin mean parameter values: R0 = 0.04934 Q = 10.51 Req = 0.32318
stop code counts: low_soc: 1 pos_err: 0 success: 3
[INFO] digital twin mission success on i: 117 mission_id: 947
trajectory <13> selected for TrueSystem
[INFO] simulating true system on i: 118
Bumping sigmax
[INFO] updating degradation parameter variance on i: 118
[INFO] updating degradation parameter values via random sampling on i: 118

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[INFO] i: 118 mission_id: 948 rul_hat: 12.95 flight_time: 6.37 distance: 481.29 R0: 0.04488 Q: 11.99 Req: 0.32188
[INFO] success on i: 118 mission_id: 948
[INFO] forecasting degradation values: r_mu: 0.050648 q_mu: 10.909710 m_mu: 0.323882
[INFO] digital twin degradation parameters: 0.0507 10.8058 0.3183
[INFO] DigitalTwin selecting trajectory: <17> with path_time: 6.03 that meets constraint: path_time < 12.95
[INFO] simulating digital twin on i 118, mission_id: 948
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0508 10.7775 0.3157
[INFO] simulating digital twin on i 118, mission_id: 948
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0508 10.9757 0.3182
[INFO] simulating digital twin on i 118, mission_id: 948
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0506 10.7075 0.3297
[INFO] simulating digital twin on i 118, mission_id: 948
[INFO] digital twin degradation parameters: 0.0506 10.7075 0.3297
[INFO] DigitalTwin mean parameter values: R0 = 0.05074 Q = 10.82 Req = 0.32050
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 118 mission_id: 948
trajectory <17> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <17> with path_time: 6.03 that meets constraint: path_time < 12.95
[INFO] simulating true system on i: 119
Bumping sigmax
[INFO] updating degradation parameter variance on i: 119
[INFO] updating degradation parameter values via random sampling on i: 119
[INFO] i: 119 mission_id: 949 rul_hat: 12.95 flight_time: 6.02 distance: 433.68 R0: 0.04668 Q: 11.44 Req: 0.32381
[INFO] success on i: 119 mission_id: 949
[INFO] forecasting degradation values: r_mu: 0.052329 q_mu: 11.288923 m_mu: 0.323858
[INFO] digital twin degradation parameters: 0.0522 11.5372 0.3256
[INFO] DigitalTwin selecting trajectory: <18> with path_time: 11.78 that meets constraint: path_time < 12.95
[INFO] simulating digital twin on i 119, mission_id: 949
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0523 11.0672 0.3276
[INFO] simulating digital twin on i 119, mission_id: 949
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0525 11.9074 0.3264
[INFO] simulating digital twin on i 119, mission_id: 949
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0522 11.3392 0.3188
[INFO] simulating digital twin on i 119, mission_id: 949
[INFO] digital twin degradation parameters: 0.0522 11.3392 0.3188
[INFO] DigitalTwin mean parameter values: R0 = 0.05232 Q = 11.46 Req = 0.32459
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 119 mission_id: 949
trajectory <18> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <18> with path_time: 11.78 that meets constraint: path_time < 12.95
[INFO] simulating true system on i: 120
Bumping sigmax
[INFO] updating degradation parameter variance on i: 120
[INFO] updating degradation parameter values via random sampling on i: 120
[INFO] i: 120 mission_id: 950 rul_hat: 12.95 flight_time: 11.79 distance: 890.37 R0: 0.04772 Q: 11.15 Req: 0.31955
[INFO] success on i: 120 mission_id: 950
[INFO] forecasting degradation values: r_mu: 0.054086 q_mu: 11.180166 m_mu: 0.326755
[INFO] digital twin degradation parameters: 0.0541 10.9013 0.3301
[INFO] DigitalTwin selecting trajectory: <17> with path_time: 6.03 that meets constraint: path_time < 12.95
[INFO] simulating digital twin on i 120, mission_id: 950
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0541 11.3349 0.3358
[INFO] simulating digital twin on i 120, mission_id: 950
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0541 11.1357 0.3356
[INFO] simulating digital twin on i 120, mission_id: 950
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0538 11.0660 0.3389
[INFO] simulating digital twin on i 120, mission_id: 950

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[INFO] digital twin degradation parameters: 0.0538 11.0660 0.3389
[INFO] DigitalTwin mean parameter values: R0 = 0.05403 Q = 11.11 Req = 0.33510
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 120 mission_id: 950
trajectory <17> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <17> with path_time: 6.03 that meets constraint: path_time < 12.95
[INFO] simulating true system on i: 121
Bumping sigma_x
[INFO] updating degradation parameter variance on i: 121
[INFO] updating degradation parameter values via random sampling on i: 121
[INFO] i: 121 mission_id: 951 rul_hat: 12.95 flight_time: 6.02 distance: 433.66 R0: 0.04953 Q: 11.12 Req: 0.31869
[INFO] success on i: 121 mission_id: 951
[INFO] forecasting degradation values: r_mu: 0.055507 q_mu: 11.120465 m_mu: 0.325755
[INFO] digital twin degradation parameters: 0.0556 10.5930 0.3218
[INFO] DigitalTwin selecting trajectory: <14> with path_time: 14.81 to explore constraint boundary < 12.95
[INFO] simulating digital twin on i 121, mission_id: 951
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0556 11.1521 0.3292
[INFO] simulating digital twin on i 121, mission_id: 951
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0554 11.1750 0.3179
[INFO] simulating digital twin on i 121, mission_id: 951
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0556 11.0428 0.3290
[INFO] simulating digital twin on i 121, mission_id: 951
[INFO] digital twin degradation parameters: 0.0556 11.0428 0.3290
[INFO] DigitalTwin mean parameter values: R0 = 0.05553 Q = 10.99 Req = 0.32447
stop code counts: low_soc: 1 pos_err: 0 success: 3
[INFO] digital twin mission success on i: 121 mission_id: 951
trajectory <14> selected for TrueSystem
[INFO] new RUL update is available, 13.69 replaces 12.95
[INFO] simulating true system on i: 122
Bumping sigma_x
[INFO] updating degradation parameter variance on i: 122
[INFO] updating degradation parameter values via random sampling on i: 122
[INFO] i: 122 mission_id: 952 rul_hat: 13.69 flight_time: 13.28 distance: 990.08 R0: 0.05153 Q: 10.65 Req: 0.31661
[INFO] success on i: 122 mission_id: 952
[INFO] forecasting degradation values: r_mu: 0.057236 q_mu: 11.068051 m_mu: 0.318477
[INFO] digital twin degradation parameters: 0.0571 11.2802 0.3205
[INFO] DigitalTwin selecting trajectory: <5> with path_time: 13.30 that meets constraint: path_time < 13.69
[INFO] simulating digital twin on i 122, mission_id: 952
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0572 10.6713 0.3134
[INFO] simulating digital twin on i 122, mission_id: 952
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0571 11.3068 0.3155
[INFO] simulating digital twin on i 122, mission_id: 952
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0571 10.9238 0.3143
[INFO] simulating digital twin on i 122, mission_id: 952
[INFO] digital twin degradation parameters: 0.0571 10.9238 0.3143
[INFO] DigitalTwin mean parameter values: R0 = 0.05713 Q = 11.05 Req = 0.31591
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 122 mission_id: 952
trajectory <5> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <5> with path_time: 13.30 that meets constraint: path_time < 13.69
[INFO] simulating true system on i: 123
Bumping sigma_x
[INFO] updating degradation parameter variance on i: 123
[INFO] updating degradation parameter values via random sampling on i: 123
[INFO] i: 123 mission_id: 953 rul_hat: 13.69 flight_time: 13.28 distance: 994.21 R0: 0.05279 Q: 11.20 Req: 0.32859
[WARN] true system low soc threshold exceeded on i: 123 mission_id: 953
[INFO] forecasting degradation values: r_mu: 0.059330 q_mu: 10.414864 m_mu: 0.326055
[INFO] digital twin degradation parameters: 0.0594 10.4256 0.3213
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 that meets constraint: path_time < 13.69

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[INFO] simulating digital twin on i 123, mission_id: 953
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0592 10.1463 0.3304
[INFO] simulating digital twin on i 123, mission_id: 953
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0594 9.9752 0.3253
[INFO] simulating digital twin on i 123, mission_id: 953
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0594 10.2623 0.3299
[INFO] simulating digital twin on i 123, mission_id: 953
[INFO] digital twin degradation parameters: 0.0594 10.2623 0.3299
[INFO] DigitalTwin mean parameter values: R0 = 0.05934 Q = 10.20 Req = 0.32672
stop code counts: low_soc: 0 pos_err: 4 success: 0
[WARN] DigitalTwin position error threshold exceeded on i: 123 mission_id: 953
[INFO] updating RUL from 13.69 to 12.30
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <16> with path_time: 6.38 that meets constraint: path_time < 12.30
[INFO] simulating digital twin on i 123, mission_id: 953
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0593 10.5841 0.3303
[INFO] simulating digital twin on i 123, mission_id: 953
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0594 10.3549 0.3307
[INFO] simulating digital twin on i 123, mission_id: 953
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0592 10.4510 0.3330
[INFO] simulating digital twin on i 123, mission_id: 953
[INFO] digital twin degradation parameters: 0.0592 10.4510 0.3330
[INFO] DigitalTwin mean parameter values: R0 = 0.05931 Q = 10.41 Req = 0.33096
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 123 mission_id: 953
trajectory <16> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <16> with path_time: 6.38 that meets constraint: path_time < 12.30
[INFO] simulating true system on i: 124
Bumping sigma_max
[INFO] updating degradation parameter variance on i: 124
[INFO] updating degradation parameter values via random sampling on i: 124
[INFO] i: 124 mission_id: 954 rul_hat: 12.30 flight_time: 6.37 distance: 481.34 R0: 0.05467 Q: 10.81 Req: 0.33793
[INFO] success on i: 124 mission_id: 954
[INFO] forecasting degradation values: r_mu: 0.061143 q_mu: 10.895372 m_mu: 0.326865
[INFO] digital twin degradation parameters: 0.0611 11.0058 0.3228
[INFO] DigitalTwin selecting trajectory: <19> with path_time: 4.33 that meets constraint: path_time < 12.30
[INFO] simulating digital twin on i 124, mission_id: 954
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0611 10.9769 0.3329
[INFO] simulating digital twin on i 124, mission_id: 954
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0610 10.9468 0.3169
[INFO] simulating digital twin on i 124, mission_id: 954
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0611 11.3780 0.3316
[INFO] simulating digital twin on i 124, mission_id: 954
[INFO] digital twin degradation parameters: 0.0611 11.3780 0.3316
[INFO] DigitalTwin mean parameter values: R0 = 0.06110 Q = 11.08 Req = 0.32605
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 124 mission_id: 954
trajectory <19> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <19> with path_time: 4.33 that meets constraint: path_time < 12.30
[INFO] simulating true system on i: 125
Bumping sigma_max
[INFO] updating degradation parameter variance on i: 125
[INFO] updating degradation parameter values via random sampling on i: 125
[INFO] i: 125 mission_id: 955 rul_hat: 12.30 flight_time: 4.25 distance: 296.67 R0: 0.05674 Q: 10.87 Req: 0.33201
[INFO] success on i: 125 mission_id: 955
[INFO] forecasting degradation values: r_mu: 0.063198 q_mu: 10.676069 m_mu: 0.336597

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[INFO] digital twin degradation parameters: 0.0633 10.6798 0.3447
[INFO] DigitalTwin selecting trajectory: <18> with path_time: 11.78 that meets constraint: path_time < 12.30
[INFO] simulating digital twin on i 125, mission_id: 955
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0631 10.6262 0.3347
[INFO] simulating digital twin on i 125, mission_id: 955
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0631 11.0104 0.3285
[INFO] simulating digital twin on i 125, mission_id: 955
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0631 10.4337 0.3342
[INFO] simulating digital twin on i 125, mission_id: 955
[INFO] digital twin degradation parameters: 0.0631 10.4337 0.3342
[INFO] DigitalTwin mean parameter values: R0 = 0.06317 Q = 10.69 Req = 0.33554
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 125 mission_id: 955
trajectory <18> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <18> with path_time: 11.78 that meets constraint: path_time < 12.30
[INFO] simulating true system on i: 126
Bumping sigmax
[INFO] updating degradation parameter variance on i: 126
[INFO] updating degradation parameter values via random sampling on i: 126
[INFO] i: 126 mission_id: 956 rul_hat: 12.30 flight_time: 11.79 distance: 890.54 R0: 0.05808 Q: 11.01 Req: 0.32532
[INFO] success on i: 126 mission_id: 956
[INFO] forecasting degradation values: r_mu: 0.065581 q_mu: 10.741886 m_mu: 0.339778
[INFO] digital twin degradation parameters: 0.0655 10.7672 0.3452
[INFO] DigitalTwin selecting trajectory: <19> with path_time: 4.33 that meets constraint: path_time < 12.30
[INFO] simulating digital twin on i 126, mission_id: 956
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0655 10.9038 0.3450
[INFO] simulating digital twin on i 126, mission_id: 956
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0657 10.6125 0.3399
[INFO] simulating digital twin on i 126, mission_id: 956
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0656 10.5905 0.3411
[INFO] simulating digital twin on i 126, mission_id: 956
[INFO] digital twin degradation parameters: 0.0656 10.5905 0.3411
[INFO] DigitalTwin mean parameter values: R0 = 0.06557 Q = 10.72 Req = 0.34281
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 126 mission_id: 956
trajectory <19> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <19> with path_time: 4.33 that meets constraint: path_time < 12.30
[INFO] simulating true system on i: 127
Bumping sigmax
[INFO] updating degradation parameter variance on i: 127
[INFO] updating degradation parameter values via random sampling on i: 127
[INFO] i: 127 mission_id: 957 rul_hat: 12.30 flight_time: 4.25 distance: 296.66 R0: 0.06038 Q: 10.74 Req: 0.33236
[INFO] success on i: 127 mission_id: 957
[INFO] forecasting degradation values: r_mu: 0.067471 q_mu: 10.662339 m_mu: 0.335493
[INFO] digital twin degradation parameters: 0.0677 10.6604 0.3390
[INFO] DigitalTwin selecting trajectory: <18> with path_time: 11.78 that meets constraint: path_time < 12.30
[INFO] simulating digital twin on i 127, mission_id: 957
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0674 10.8035 0.3315
[INFO] simulating digital twin on i 127, mission_id: 957
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0673 10.6756 0.3333
[INFO] simulating digital twin on i 127, mission_id: 957
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0675 10.6835 0.3391
[INFO] simulating digital twin on i 127, mission_id: 957
[INFO] digital twin degradation parameters: 0.0675 10.6835 0.3391
[INFO] DigitalTwin mean parameter values: R0 = 0.06749 Q = 10.71 Req = 0.33574
stop code counts: low_soc: 0 pos_err: 0 success: 4

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[INFO] digital twin mission success on i: 127 mission_id: 957
      trajectory <18> selected for TrueSystem
[INFO] TrueSystem selecting trajectory: <18> with path_time: 11.78 that meets constraint: path_time < 12.30
[INFO] simulating true system on i: 128
Bumping sigma_max
[INFO] updating degradation parameter variance on i: 128
[INFO] updating degradation parameter values via random sampling on i: 128
[INFO] i: 128 mission_id: 958 rul_hat: 12.30 flight_time: 11.79 distance: 890.45 R0: 0.06270 Q: 10.43 Req: 0.32525
[INFO] success on i: 128 mission_id: 958
[INFO] forecasting degradation values: r_mu: 0.069743 q_mu: 10.359916 m_mu: 0.341029
[INFO] digital twin degradation parameters: 0.0698 10.4365 0.3363
[INFO] DigitalTwin selecting trajectory: <10> with path_time: 13.57 to explore constraint boundary < 12.30
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0698 10.4284 0.3448
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0699 10.2944 0.3324
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0698 10.1280 0.3472
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] digital twin degradation parameters: 0.0698 10.1280 0.3472
[INFO] DigitalTwin mean parameter values: R0 = 0.06982 Q = 10.32 Req = 0.34019
      stop code counts: low_soc: 0 pos_err: 4 success: 0
[WARN] DigitalTwin position error threshold exceeded on i: 128 mission_id: 958
[INFO] updating RUL from 12.30 to 10.74
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] DigitalTwin selecting trajectory: <16> with path_time: 6.38 that meets constraint: path_time < 10.74
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0699 10.1584 0.3355
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0698 10.0192 0.3444
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0698 10.3241 0.3393
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] digital twin degradation parameters: 0.0698 10.3241 0.3393
[INFO] DigitalTwin mean parameter values: R0 = 0.06984 Q = 10.16 Req = 0.34162
      stop code counts: low_soc: 0 pos_err: 2 success: 2
[WARN] DigitalTwin position error threshold exceeded on i: 128 mission_id: 958
[INFO] updating RUL from 10.74 to 8.74
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] digital twin rul_hat: 5.00 does not meet the threshold: 10.00 on i,mission 128,958 with fail_count 1
[INFO] DigitalTwin selecting trajectory: <16> with path_time: 6.38 to explore constraint boundary < 5.00
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0697 10.1252 0.3370
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0697 10.7873 0.3391
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0697 10.2479 0.3446
[INFO] simulating digital twin on i 128, mission_id: 958
[INFO] digital twin degradation parameters: 0.0697 10.2479 0.3446
[INFO] DigitalTwin mean parameter values: R0 = 0.06972 Q = 10.37 Req = 0.33999
      stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 128 mission_id: 958
      trajectory <16> selected for TrueSystem
[INFO] new RUL update is available, 5.37 replaces 5.00
[INFO] digital twin rul_hat: 5.37 does not meet the threshold: 10.00 on i,mission 128,958 with fail_count 2
[INFO] simulating true system on i: 129

```

```

Bumping sigmax
[INFO] updating degradation parameter variance on i: 129
[INFO] updating degradation parameter values via random sampling on i: 129
[INFO] i: 129 mission_id: 959 rul_hat: 5.37 flight_time: 4.25 distance: 296.67 R0: 0.06423 Q: 10.37 Req: 0.33341
[INFO] success on i: 129 mission_id: 959
[INFO] forecasting degradation values: r_mu: 0.072396 q_mu: 9.972215 m_mu: 0.331134
[INFO] digital twin degradation parameters: 0.0722 10.1062 0.3346
[INFO] DigitalTwin selecting trajectory: <19> with path_time: 4.33 that meets constraint: path_time < 5.37
[INFO] simulating digital twin on i 129, mission_id: 959
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0724 10.0129 0.3369
[INFO] simulating digital twin on i 129, mission_id: 959
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0724 10.2321 0.3306
[INFO] simulating digital twin on i 129, mission_id: 959
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0723 9.9627 0.3301
[INFO] simulating digital twin on i 129, mission_id: 959
[INFO] digital twin degradation parameters: 0.0723 9.9627 0.3301
[INFO] DigitalTwin mean parameter values: R0 = 0.07235 Q = 10.08 Req = 0.33305
stop code counts: low_soc: 0 pos_err: 4 success: 0
[WARN] DigitalTwin position error threshold exceeded on i: 129 mission_id: 959
[INFO] updating RUL from 5.37 to 3.37
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] digital twin rul_hat: 2.25 does not meet the threshold: 10.00 on i,mission 129,959 with fail_count 3
[INFO] DigitalTwin selecting trajectory: <7> with path_time: 0.91 that meets constraint: path_time < 2.25
[INFO] simulating digital twin on i 129, mission_id: 959
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0724 9.7619 0.3304
[INFO] simulating digital twin on i 129, mission_id: 959
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0725 9.8685 0.3278
[INFO] simulating digital twin on i 129, mission_id: 959
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0725 9.9975 0.3293
[INFO] simulating digital twin on i 129, mission_id: 959
[INFO] digital twin degradation parameters: 0.0725 9.9975 0.3293
[INFO] DigitalTwin mean parameter values: R0 = 0.07243 Q = 9.90 Req = 0.32941
stop code counts: low_soc: 0 pos_err: 0 success: 4
[INFO] digital twin mission success on i: 129 mission_id: 959
trajectory <7> selected for TrueSystem
[INFO] digital twin rul_hat: 2.25 does not meet the threshold: 10.00 on i,mission 129,959 with fail_count 4
[INFO] TrueSystem selecting trajectory: <7> with path_time: 0.91 that meets constraint: path_time < 2.25
[INFO] simulating true system on i: 130
Bumping sigmax
[INFO] updating degradation parameter variance on i: 130
[INFO] updating degradation parameter values via random sampling on i: 130
[INFO] i: 130 mission_id: 960 rul_hat: 2.25 flight_time: 0.91 distance: 69.40 R0: 0.06652 Q: 10.26 Req: 0.33604
[INFO] success on i: 130 mission_id: 960
[INFO] forecasting degradation values: r_mu: 0.074498 q_mu: 9.733676 m_mu: 0.339766
[INFO] digital twin degradation parameters: 0.0745 9.8134 0.3325
[INFO] DigitalTwin selecting trajectory: <7> with path_time: 0.91 that meets constraint: path_time < 2.25
[INFO] simulating digital twin on i 130, mission_id: 960
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0745 9.3420 0.3451
[INFO] simulating digital twin on i 130, mission_id: 960
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0744 9.8092 0.3409
[INFO] simulating digital twin on i 130, mission_id: 960
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0744 9.0183 0.3424
[INFO] simulating digital twin on i 130, mission_id: 960
[INFO] digital twin degradation parameters: 0.0744 9.0183 0.3424
[INFO] DigitalTwin mean parameter values: R0 = 0.07447 Q = 9.50 Req = 0.34021
stop code counts: low_soc: 0 pos_err: 1 success: 4

```

```

[INFO] digital twin mission success on i: 130 mission_id: 960
      trajectory <7> selected for TrueSystem
[INFO] digital twin rul_hat: 2.25 does not meet the threshold: 10.00 on i,mission 130,960 with fail_count 5
[INFO] TrueSystem selecting trajectory: <7> with path_time: 0.91 that meets constraint: path_time < 2.25
[INFO] simulating true system on i: 131
Bumping sigmax
[INFO] updating degradation parameter variance on i: 131
[INFO] updating degradation parameter values via random sampling on i: 131
[INFO] i: 131 mission_id: 961 rul_hat: 2.25 flight_time: 0.91 distance: 69.43 R0: 0.06906 Q: 10.36 Req: 0.33857
[INFO] success on i: 131 mission_id: 961
[INFO] forecasting degradation values: r_mu: 0.076913 q_mu: 9.752786 m_mu: 0.345259
[INFO] digital twin degradation parameters: 0.0768 9.9206 0.3460
[INFO] DigitalTwin selecting trajectory: <7> with path_time: 0.91 that meets constraint: path_time < 2.25
[INFO] simulating digital twin on i 131, mission_id: 961
[INFO] resampling for twin run # 2
[INFO] digital twin degradation parameters: 0.0770 9.8714 0.3515
[INFO] simulating digital twin on i 131, mission_id: 961
[INFO] resampling for twin run # 3
[INFO] digital twin degradation parameters: 0.0768 9.5290 0.3468
[INFO] simulating digital twin on i 131, mission_id: 961
[INFO] resampling for twin run # 4
[INFO] digital twin degradation parameters: 0.0770 9.9598 0.3453
[INFO] simulating digital twin on i 131, mission_id: 961
[INFO] digital twin degradation parameters: 0.0770 9.9598 0.3453
[INFO] DigitalTwin mean parameter values: R0 = 0.07691 Q = 9.82 Req = 0.34741
      stop code counts: low_soc: 0 pos_err: 4 success: 0
[WARN] DigitalTwin position error threshold exceeded on i: 131 mission_id: 961
[INFO] updating RUL from 2.25 to 0.25
[INFO] selecting new trajectory to repeat DigitalTwin simulation
[INFO] digital twin rul_hat: -0.69 does not meet the threshold: 10.00 on i,mission 131,961 with fail_count 6
[INFO] returning empty table
Unrecognized table variable name 'path_time'.

```

\*\*\*\*\* end of simulation code

### test sim digital twin (for testing)

```

i = 1;
sys = "DigitalTwin";
octomodel.sampletime = true_sample_rate;
sprintf('[INFO] simulating digital twin on mission: %d', i);
tic
sim('digitaltwin1c.slx');
toc

```

```
clear('trajectory', 'battery_actual', 'battery_observed', 'ctrl_err', 'current', 'current_rs',
```

### test sim true system (for testing)

```

i = 1;
sys = "TrueSystem";
octomodel.sampletime = true_sample_rate;
sprintf('[INFO] simulating true system on mission: %d', i);
tic
sim('truesystem.slx');

```

## define placeholder variables

```
twin_ctr = 1;
twin_count = 4;
times = zeros(1, twin_count);
vs = zeros(1, twin_count);
socs = zeros(1, twin_count);
r0s = zeros(1, twin_count);
qs = zeros(1, twin_count);
ms = zeros(1, twin_count);
dist = zeros(1, twin_count);
errs = zeros(1, twin_count);
degs = zeros(3, twin_count);
codes = zeros(3, twin_count);
```

## Update twin degradation parameters

```
if i > lookback
    x = double(((i - (lookback-1)):1:i)');
    r_poly = polyfit(x, smoothdata(r_deg(x), 'rlowess', 5), 1);
    q_poly = polyfit(x, smoothdata(q_deg(x), 'rlowess', 5), 1);
    m_poly = polyfit(x, smoothdata(m_deg(x), 'rlowess', 5), 1);

    polys(i, 1, :) = r_poly;
    polys(i, 2, :) = q_poly;
    polys(i, 3, :) = m_poly;

    r_mu = polyval(r_poly, i + horizon);
    q_mu = polyval(q_poly, i + horizon);
    m_mu = polyval(m_poly, i + horizon);
    fprintf('[INFO] forecasting degradation values: r_mu: %.6f\tq_mu: %.6f\tm_mu: %.6f', r_mu,
    batterytwin.R0 = max(abs(normrnd(r_mu, r_var)), .0001);
    batterytwin.Q = min(abs(normrnd(q_mu, q_var)), 15.5);
    Motortwin2.Req = max(abs(normrnd(m_mu, m_var)), .001);
else
    batterytwin.R0 = max(abs(normrnd(rdeg(i), r_var)), .0001);
    batterytwin.Q = min(abs(normrnd(qdeg(i), q_var)), 15.5);
    Motortwin2.Req = max(abs(normrnd(mdeg(i), m_var)), .001);
end
fprintf("[INFO] digital twin degradation parameters: %.4f\t%.4f\t%.4f", batterytwin.R0, battery
write_degradation_data;
```

## now simulate digital twin

```
load_trajectory;
if trajectory.path_time > rul_hat
    fprintf("[INFO] DigitalTwin selecting trajectory: <%d> with path_time: %.2f to explore cons
else
    fprintf("[INFO] DigitalTwin selecting trajectory: <%d> with path_time: %.2f that meets cons
end
```

```

sys = "DigitalTwin";
octomodel.sampletime = twin_sample_rate;
for twin_ctr=1:twin_count
    fprintf('[INFO] simulating digital twin on i %d, mission_id: %d\n', i, mission_id)
    out = sim('digitaltwin1c.slx');
    %           get the output from each parallel worker
    times(twin_ctr) = flight_time.Data(end);
    vs(twin_ctr) = battery_actual.Data(end, 1);
    socs(twin_ctr) = battery_actual.Data(end, 2);
    r0s(twin_ctr) = battery_actual.Data(end, 3);
    qs(twin_ctr) = battery_actual.Data(end, 6);
    ms(twin_ctr) = motors.Data(end, 1);
    errs(twin_ctr) = mean(euclidean_pos_err);
    dist(twin_ctr) = calculatedistance([pos_actual.Data(:,1) pos_actual.Data(:,2)]);
    degs(:, twin_ctr) = [batterytwin.R0 batterytwin.Q Motortwin2.Req]';
    codes(:, twin_ctr) = [any(stop_code.Data(:,1)); any(stop_code.Data(:,2)); any(stop_code.Data(:,3))];
end

```

### write digital twin parameters to db

```
write_twin_params_data;
```

### resample the degradation parameters for the next digital twin simulation

```

if twin_count > 1 && twin_ctr < twin_count
    fprintf('[INFO] resampling for twin run # %d', twin_ctr + 1);
    if i > lookback
        batterytwin.R0 = normrnd(r_mu, r_var);
        batterytwin.Q = normrnd(q_mu, q_var);
        Motortwin2.Req = normrnd(m_mu, m_var);
    else
        batterytwin.R0 = max(abs(normrnd(rdeg(i), r_var)), .00075);
        batterytwin.Q = min(abs(normrnd(qdeg(i), q_var)), 15.5);
        Motortwin2.Req = max(abs(normrnd(mdeg(i), m_var)), .001);
    end
end
fprintf("[INFO] digital twin degradation parameters: %.4f\t%.4f\t%.4f", batterytwin.R0, batterytwin.Q, Motortwin2.Req);

low_soc = sum(codes(1,:) == 1);
pos_err = sum(codes(2,:) == 1);
success = sum(codes(3,:) == 1);
fprintf("[INFO] digital twin mean parameter values: R0 = %.5f\t Q = %.2f\t Req = %.5f\n\t stop_code = %d", low_soc, pos_err, success, stop_code);

```

### update rul

```

updated = false;
if low_soc > 1
    fprintf('[WARN] digital twin low soc threshold exceeded on i: %d\tmission_id: %d\n', i, mission_id);
    fprintf('[INFO] updating RUL from %.2f to %.2f', rul_hat, min(mean(times(:)) - 1));
    rul_hat = mean(times(:)) - 1; % rul is now 1 minute less than the digital twin flight time
    updated = true;
end

if pos_err > 1
    fprintf('[WARN] digital twin pos_err threshold exceeded on i: %d\tmission_id: %d\n', i, mission_id);
    fprintf('[INFO] updating RUL from %.2f to %.2f', rul_hat, min(mean(times(:)) - 1));
    rul_hat = mean(times(:)) - 1; % rul is now 1 minute less than the digital twin flight time
    updated = true;
end

```

```

    fprintf('[WARN] digital twin position error threshold exceeded on i: %d\tmission_id: %d\n',
    fprintf('[INFO] updating RUL from %.2f to %.2f', rul_hat, min(mean(times(:)) - 1))
    rul_hat = mean(times(:)) - 1; % rul is now 1 minute less than the digital twin flight time
    updated = true;
end

if success >= 3 && pos_err < 2 && low_soc < 2
    fprintf('[INFO] digital twin mission success on i: %d\tmission_id: %d\n', i, mission_id)
    if mean(times(:)) - 1 > rul_hat
        fprintf('[INFO] new RUL update is available, %.2f replaces %.2f\n', mean(times(:)) - 1,
        rul_hat = mean(times(:)) - 1;
    end
elseif ~updated
    fprintf('[WARN] digital twin mission uncertain on i: %d\tmission_id: %d, rul_hat: %.2f remains
end
% otherwise, end of life was never reached so the current rul estimate
% is the best estimate

if rul_hat <= rul_threshold
    fail_count = fail_count + 1;
    fprintf('[INFO] digital twin rul_hat: %.2f does not meet the threshold: %.2f on i,mission %
    if fail_count == 10
        fprintf('[INFO] fail_count reached limit. Stopping simulation.')
        end_sim = 1;
        %break;
    end
end
end
clear('trajectory', 'battery_actual', 'battery_observed', 'ctrl_err', 'current', 'current_r

```