Non-Heuristic Search Analyses

```
Solving Air Cargo Problem 1 using breadth_first_search...

Expansions   Goal Tests   New Nodes
    43          56         180

Optimality of solution: 6
Time elapsed in seconds: 0.030091724009253085


Solving Air Cargo Problem 1 using depth_first_graph_search...

Expansions   Goal Tests   New Nodes
    21          22          84

Optimality of solution: 20
Time elapsed in seconds: 0.012733761017443612


Solving Air Cargo Problem 1 using depth_limited_search...

Expansions   Goal Tests   New Nodes
   101         271         414

Optimality of solution: 50
Time elapsed in seconds: 0.08026853401679546
```

```
Solving Air Cargo Problem 2 using breadth_first_search...

Expansions   Goal Tests   New Nodes
   1765        2376       14713

Optimality of solution: 9
Time elapsed in seconds: 3.2836126890033484

Solving Air Cargo Problem 2 using depth_first_graph_search...

Expansions   Goal Tests   New Nodes
   1999        2000       15982

Optimality of solution: 327
Time elapsed in seconds: 3.991107910987921


Solving Air Cargo Problem 2 using depth_limited_search...
```

Took more than 10 minutes to solve

Solving Air Cargo **Problem 3 using breadth_first_search...**

Expansions	Goal Tests	New Nodes
14120	17673	124926

Optimality of solution: 12
Time elapsed in seconds: 59.51860062999185

Solving Air Cargo **Problem 3 using depth_first_graph_search...**

Expansions	Goal Tests	New Nodes
292	293	2388

Optimality of solution: 288
Time elapsed in seconds: 1.746686728001805

Solving Air Cargo **Problem 3 using depth_limited_search...**

Took more than 10 minutes to solve

Heuristic Search Analyses

Solving Air Cargo **Problem 1 using astar_search with h_ignore_preconditions...**

Expansions	Goal Tests	New Nodes
41	43	170

Optimality of solution: 6
Time elapsed in seconds: 0.03411777998553589

Solving Air Cargo **Problem 2 using astar_search with h_ignore_preconditions...**

Expansions	Goal Tests	New Nodes
1598	1600	13299

Optimality of solution: 10
Time elapsed in seconds: 3.3241536959831137

Solving Air Cargo **Problem 3 using astar_search with h_ignore_preconditions...**

Expansions	Goal Tests	New Nodes
5040	5042	44944

```
Optimality of solution: 12
Time elapsed in seconds: 14.272548448992893

Solving Air Cargo Problem 1 using astar_search with
h_pg_levelsum...

Expansions   Goal Tests   New Nodes
    45          47         188

Optimality of solution: 6
Time elapsed in seconds: 0.8783456929959357

Solving Air Cargo Problem 2 using astar_search with
h_pg_levelsum...

Expansions   Goal Tests   New Nodes
   1509        1511       12343

Optimality of solution: 9
Time elapsed in seconds: 202.56986283801962

Solving Air Cargo Problem 3 using astar_search with
h_pg_levelsum...
```

Took more than 10 minutes to ended the execution

Best heuristic user in this problem is h_igore_precondition; though, h_levelsum performed better for problem 2 but it took a lot more time to compute. Level sum finds the least expansion node because it finds the optimal path to the goal but there cost of computation to find that optimal path and therefore not the best heuristic when it comes to finding the solution in optimal time.

H_ignore_precondition heuristic search was better than non-heuristic search as it relaxes the problem by removing all the preconditions so the search ignores what the state needs to be in order to achieve the goal and therefore quickly finds the path to the goal. Node expansion is lower when compared to non-heuristic search.