

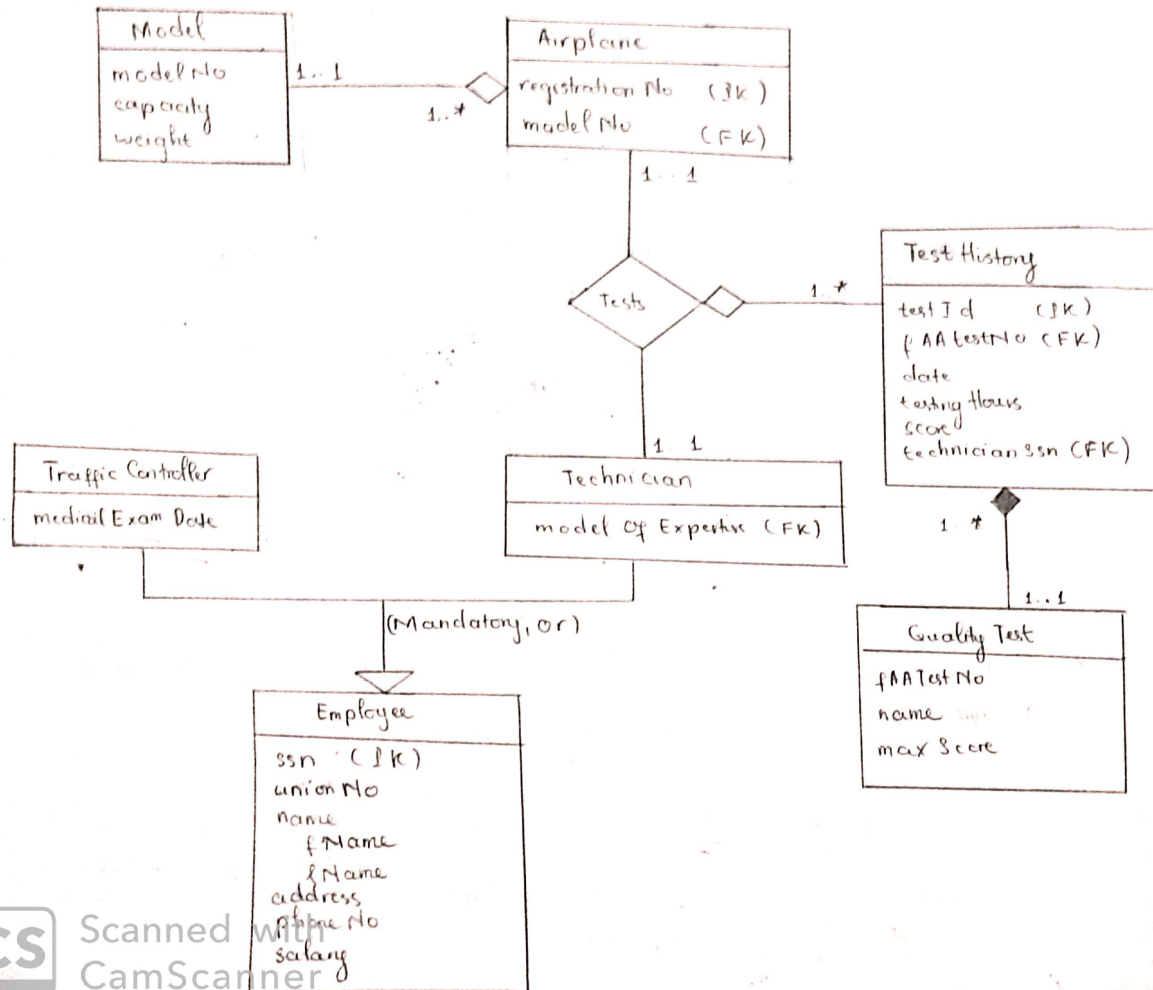
Final Project Report: Airport Information System

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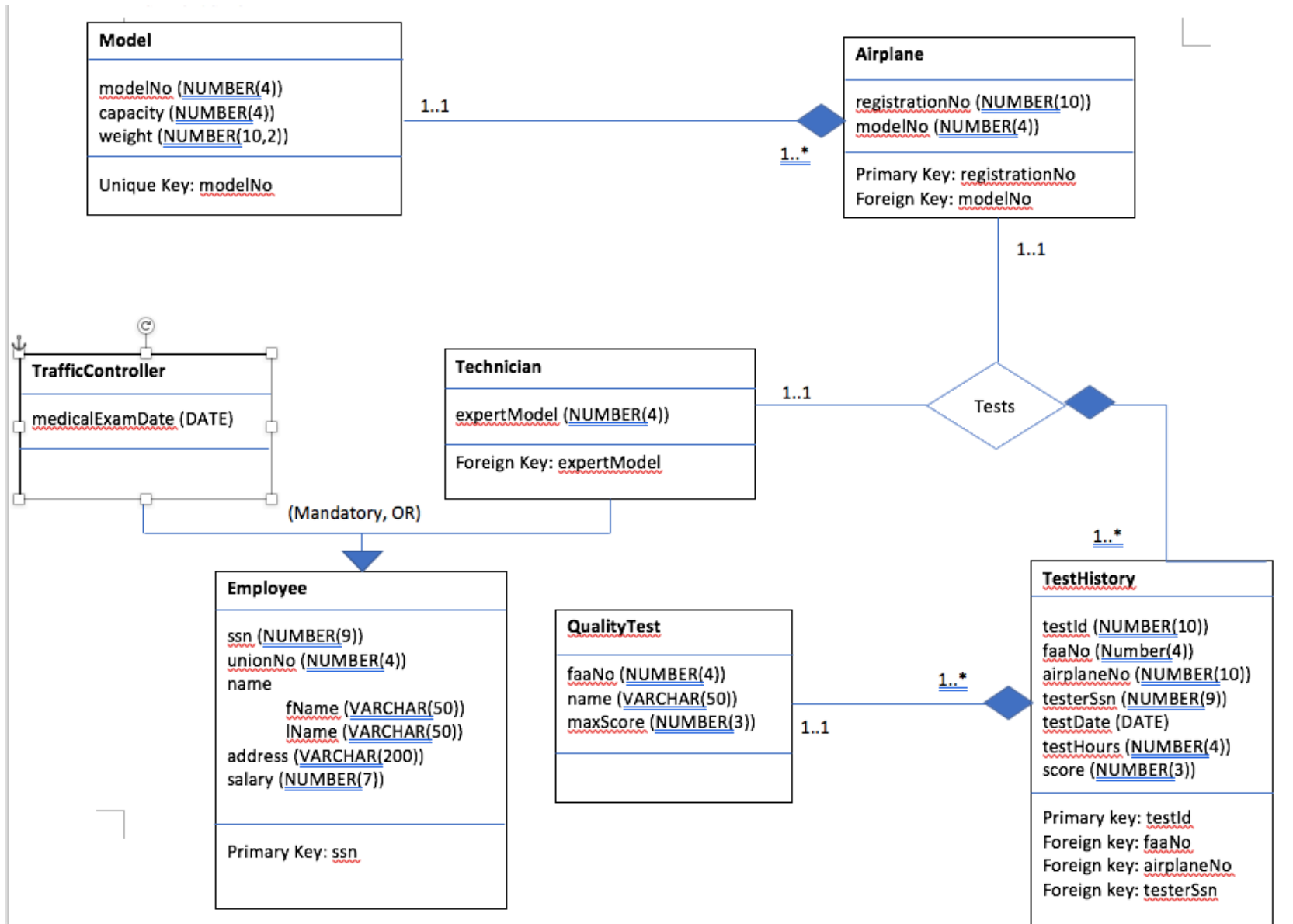
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STAGE 1: CONCEPTUAL DESIGN

Airport Information System, Conceptual Design Model



STAGE 2: LOGICAL DESIGN



STAGE 3: TEST DATA

Here is a snapshot of the sample data that is used to initialize the data table:

Table: Model

ModelNo	Capacity	Weight
1000	500	3000.5
7275	200	2310
9999	50	1000
4449	700	5000

Table: Airplane

RegistrationNo	ModelNo
123456789	4449
987543621	7275
111222333	4449
444555888	1000
999222444	7275

Table: Employee

SSN	UnionNo	FirstName	LastName	Address	Salary
721074426	0406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146	65000
264153998	0125	Martina	Velichovska	39 Stockton St, San Francisco, CA 94108	80000
170119497	2030	Gia	Do	Boulevard de Parc, 77700 Coupvray, France	72000
241032961	0406	Brad	Pitt	6701 Red Rd, Coral Gables, FL 33143	70000
619866062	0125	Clemson	Martynev	6620 SW 57th Ave, South Miami, FL 3314	82000

Table: Technician

SSN	ExpertModel
721074426	7275
721074426	1000
721074426	4449
264153998	7275
264153998	4449
170119497	7275

Table: TrafficController

SSN	MedExamDate
241032961	04/04/2020
619866062	04/01/2020

Table: QualityTest

FAANo	Name	MaxScore
1237	Wings Test	100
7321	Fuel Test	50
4421	Wheels Test	60
3445	Windows Test	20

Table: TestHistory

TestID	FAANo	AirplaneNo	TesterSSN	TestDate	TestHours	Score
0123456789	7321	123456789	721074426	04/04/2020	4	99

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0023456789	4421	111222333	264153998	09/08/2015	14	40
0003456789	3445	999222444	721074426	02/02/2019	9	17
0000456789	1237	987543621	170119497	09/08/2019	10	88
5222456789	3445	111222333	264153998	04/26/2015	12	78
777777777	7321	111222333	264153998	07/18/2015	5	14
888888988	3445	987543621	170119497	02/14/2014	20	20

STAGE 4: PROGRAM EXECUTION AND OUTPUT

Query 1: Insert a new technician into the database (Menu option 5 in program)

Data table before Insertion:

```
[thdoece467@lawtech Project]$ ./project
```

```
Connected to ORACLE as user: thdoece467
```

```
Please enter menu option:
```

```
(1) List all Airplanes and Model Info
(2) List all Technician Employee Info
(3) List all Traffic Controller Employee Info
(4) List all Test History and Quality Test Info
(5) Insert a new technician
(6) Delete an existing airplane from the database.
(7) Update the expertise of an existing technician.
(8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
(9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
(10) List the total number of technicians who are experts in each model.
(11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
(12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
(13) List the total number of tests done by each technician for a given airplane.
(14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
(0) Quit
2
```

Query 2: List all Technician Employee Info--

SSN -----	UnionNo -----	FirstName -----	LastName -----	Address -----	Salary -----	ModelOfExpertise -----
170119497	2030	Gia	Do	Boulevard de Parc, 77700 Coupvray, France 72000	7275	
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	4449	
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	7275	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	1000	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	4449	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	7275	

Please enter menu option:

- (1) List all Airplanes and Model Info
- (2) List all Technician Employee Info
- (3) List all Traffic Controller Employee Info
- (4) List all Test History and Quality Test Info
- (5) Insert a new technician
- (6) Delete an existing airplane from the database.
- (7) Update the expertise of an existing technician.
- (8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
- (9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
- (10) List the total number of technicians who are experts in each model.
- (11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
- (12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
- (13) List the total number of tests done by each technician for a given airplane.
- (14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
- (0) Quit

5

Enter technician's SSN (9-digit):

333444999

Enter technician's Union Number (4-digit at most):

5011

Enter technician's First Name:

Jade

Enter technician's Last Name:

Do

Enter technician's Address:

1100 S Dixie Hwy, Coral Gables, FL 33146

Enter technician's Salary:

64000

Enter technician's Model of Expertise:

1000

Insert: 333444999 5011 Jade Do 1100 S Dixie Hwy, Coral Gables, FL 33146 64000 1000

INSERTION SUCCESSFUL!

Data table after insertion:

```
Please enter menu option:
```

- (1) List all Airplanes and Model Info
 - (2) List all Technician Employee Info
 - (3) List all Traffic Controller Employee Info
 - (4) List all Test History and Quality Test Info
 - (5) Insert a new technician
 - (6) Delete an existing airplane from the database.
 - (7) Update the expertise of an existing technician.
 - (8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
 - (9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
 - (10) List the total number of technicians who are experts in each model.
 - (11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
 - (12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
 - (13) List the total number of tests done by each technician for a given airplane.
 - (14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
 - (0) Quit
- 2

Query 2: List all Technician Employee Info--

SSN	UnionNo	FirstName	LastName	Address	Salary	ModelOfExpertise
170119497	2030	Gia	Do	Boulevard de Parc, 77700 Coupvray, France 72000	7275	
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	4449	
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	7275	
333444999	5011	Jade	Do	1100 S Dixie Hwy, Coral Gables, FL 33146 64000	1000	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	1000	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	4449	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	7275	

Query 2: Delete an existing airplane from the database (Menu option (6) in program)

Before deletion:

Airplane table:

Query 1: List full details of every airplane--

RegistrationNo	ModelNo	Capacity	Weight
-----	-----	-----	-----
123456789	4449	700	5000.00
987543621	7275	200	2310.00
111222333	4449	700	5000.00
444555888	1000	500	3000.50
999222444	7275	200	2310.00

TestHistory table:

4	TestID	FAANo	AirplaneNo	TesterSSN	TestDate	TestHours	TestScore	TestName	MaxScore
	-----	-----	-----	-----	-----	-----	-----	-----	-----
	456789	1237	987543621	170119497	08-SEP-19	10	88	Wings Test	100
	777777777	7321	111222333	264153998	18-JUL-15	5	14	Fuel Test	50
	123456789	7321	123456789	721074426	04-APR-20	4	99	Fuel Test	50
	23456789	4421	111222333	264153998	08-SEP-15	14	40	Wheels Tes	60
	8888889885	3445	987543621	170119497	14-FEB-14	20	20	Windows Te	20
	5222456789	3445	111222333	264153998	26-APR-15	12	78	Windows Te	20
	3456789	3445	999222444	721074426	02-FEB-19	9	17	Windows Te	20

Please enter menu option:

```
Please enter menu option:
(1) List all Airplanes and Model Info
(2) List all Technician Employee Info
(3) List all Traffic Controller Employee Info
(4) List all Test History and Quality Test Info
(5) Insert a new technician
(6) Delete an existing airplane from the database.
(7) Update the expertise of an existing technician.
(8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
(9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
(10) List the total number of technicians who are experts in each model.
(11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
(12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
(13) List the total number of tests done by each technician for a given airplane.
(14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
(0) Quit
6
Enter the Registration Number of the airplane you want to delete:
123456789
DELETION SUCCESSFUL!
```

After deletion:

We can see that the entry for the airplane is deleted:

```
1

Query 1: List full details of every airplane--

RegistrationNo      ModelNo      Capacity      Weight
-----
987543621           7275         200           2310.00
111222333           4449         700           5000.00
444555888           1000         500           3000.50
999222444           7275         200           2310.00
```

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Similarly, the corresponding test history record of the deleted airplane is also deleted:

4 TestID	FAANo	AirplaneNo	TesterSSN	TestDate	TestHours	TestScore	TestName	MaxScore
-----	-----	-----	-----	-----	-----	-----	-----	-----
456789	1237	987543621	170119497	08-SEP-19	10	88	Wings Test	100
7777777777	7321	111222333	264153998	18-JUL-15	5	14	Fuel Test	50
23456789	4421	111222333	264153998	08-SEP-15	14	40	Wheels Tes	60
8888889885	3445	987543621	170119497	14-FEB-14	20	20	Windows Te	20
5222456789	3445	111222333	264153998	26-APR-15	12	78	Windows Te	20
3456789	3445	999222444	721074426	02-FEB-19	9	17	Windows Te	20

Query 3: Update the expertise of an existing technician (Menu option 7 in program)

Data table before update:

```
[thdoece467@lawtech Project]$ ./project
```

```
Connected to ORACLE as user: thdoece467
```

```
Please enter menu option:
```

```
(1) List all Airplanes and Model Info
```

```
(2) List all Technician Employee Info
```

```
(3) List all Traffic Controller Employee Info
```

```
(4) List all Test History and Quality Test Info
```

```
(5) Insert a new technician
```

```
(6) Delete an existing airplane from the database.
```

```
(7) Update the expertise of an existing technician.
```

```
(8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
```

```
(9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
```

```
(10) List the total number of technicians who are experts in each model.
```

```
(11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
```

```
(12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
```

```
(13) List the total number of tests done by each technician for a given airplane.
```

```
(14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
```

```
(0) Quit
```

```
2
```

Query 2: List all Technician Employee Info--

SSN -----	UnionNo -----	FirstName -----	LastName -----	Address -----	Salary -----	ModelOfExpertise -----
170119497	2030	Gia	Do	Boulevard de Parc, 77700 Coupvray, France 72000	7275	
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	4449	
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	7275	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	1000	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	4449	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	7275	

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Update:

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```
Please enter menu option:
(1) List all Airplanes and Model Info
(2) List all Technician Employee Info
(3) List all Traffic Controller Employee Info
(4) List all Test History and Quality Test Info
(5) Insert a new technician
(6) Delete an existing airplane from the database.
(7) Update the expertise of an existing technician.
(8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
(9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
(10) List the total number of technicians who are experts in each model.
(11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
(12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
(13) List the total number of tests done by each technician for a given airplane.
(14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
(0) Quit
7
Enter the SSN of the technician:
170119497
Enter the new model of expertise:
1000
UPDATE SUCCESSFULL!
--
```

Data table after update:

Please enter menu option:

- (1) List all Airplanes and Model Info
 - (2) List all Technician Employee Info
 - (3) List all Traffic Controller Employee Info
 - (4) List all Test History and Quality Test Info
 - (5) Insert a new technician
 - (6) Delete an existing airplane from the database.
 - (7) Update the expertise of an existing technician.
 - (8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
 - (9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
 - (10) List the total number of technicians who are experts in each model.
 - (11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
 - (12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
 - (13) List the total number of tests done by each technician for a given airplane.
 - (14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
 - (0) Quit
- 2

Query 2: List all Technician Employee Info--

SSN -----	UnionNo -----	FirstName -----	LastName -----	Address -----	Salary -----	ModelOfExpertise -----
170119497	2030	Gia	Do	Boulevard de Parc, 77700 Coupvray, France 72000	1000	
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	4449	
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	7275	
333444999	5011	Jade	Do	1100 S Dixie Hwy, Coral Gables, FL 33146 64000	1000	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	1000	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	4449	
721074426	406	Alice	Wonderland	1320 S Dixie Hwy, Miami, FL 33146 65000	7275	

Query 4: List the details of the technician whose salary is greater than the average of the salary of all technicians (Menu option 8 in program)

Please enter menu option:

- (1) List all Airplanes and Model Info
 - (2) List all Technician Employee Info
 - (3) List all Traffic Controller Employee Info
 - (4) List all Test History and Quality Test Info
 - (5) Insert a new technician
 - (6) Delete an existing airplane from the database.
 - (7) Update the expertise of an existing technician.
 - (8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
 - (9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
 - (10) List the total number of technicians who are experts in each model.
 - (11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
 - (12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
 - (13) List the total number of tests done by each technician for a given airplane.
 - (14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
 - (0) Quit
- 8

Query8: List the details of technicians whose salary is greater than the average of the salary of all technicians--

SSN -----	UnionNo -----	FirstName -----	LastName -----	Address -----	Salary -----	ModelofExpertise -----
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	4449	
264153998	125	Martina	Velichovsk	39 Stockton St, San Francisco, CA 94108 80000	7275	
170119497	2030	Gia	Do	Boulevard de Parc, 77700 Coupvray, France 72000	1000	

Query 5: List all the model numbers that a given technician has the expertise, along with their capacity and weight information (Menu option 9 in program)

Please enter menu option:

```
(1) List all Airplanes and Model Info
(2) List all Technician Employee Info
(3) List all Traffic Controller Employee Info
(4) List all Test History and Quality Test Info
(5) Insert a new technician
(6) Delete an existing airplane from the database.
(7) Update the expertise of an existing technician.
(8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
(9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
(10) List the total number of technicians who are experts in each model.
(11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
(12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
(13) List the total number of tests done by each technician for a given airplane.
(14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
(0) Quit
9
Enter the technician's SSN (9-digit):
721074426
```

Query 9: List all the model numbers that a given technician has expertise, along with their capacity and weight information--

SSN -----	FirstName -----	LastName -----	ModelOfExpertise -----	Capacity -----	Weight -----
721074426	Alice	Wonderland	1000	500	3000.50
721074426	Alice	Wonderland	7275	200	2310.00
721074426	Alice	Wonderland	4449	700	5000.00

Query 6: List the total number of technicians who are experts in each model (Menu option 10 in program)

Please enter menu option:

- (1) List all Airplanes and Model Info
- (2) List all Technician Employee Info
- (3) List all Traffic Controller Employee Info
- (4) List all Test History and Quality Test Info
- (5) Insert a new technician
- (6) Delete an existing airplane from the database.
- (7) Update the expertise of an existing technician.
- (8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
- (9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
- (10) List the total number of technicians who are experts in each model.
- (11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
- (12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
- (13) List the total number of tests done by each technician for a given airplane.
- (14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
- (0) Quit

[10

Query 10: List the total number of technicians who are experts in each model

Model	Total Experts
-----	-----
1000	3
4449	2
7275	2

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Query 7: List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores (Menu option 11 in program)

Please enter menu option:

- (1) List all Airplanes and Model Info
- (2) List all Technician Employee Info
- (3) List all Traffic Controller Employee Info
- (4) List all Test History and Quality Test Info
- (5) Insert a new technician
- (6) Delete an existing airplane from the database.
- (7) Update the expertise of an existing technician.
- (8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
- (9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
- (10) List the total number of technicians who are experts in each model.
- (11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
- (12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
- (13) List the total number of tests done by each technician for a given airplane.
- (14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
- (0) Quit

11

Enter the Airplane's Registration Number (9-digit):

987543621

TestID	FAANo	AirplaneNo	TesterSSN	TestDate	TestHours	TestScore	TestName	MaxScore
456789	1237	987543621	170119497	08-SEP-19	10	88	Wings Test	100
8888889885	3445	987543621	170119497	14-FEB-14	20	20	Windows Te	20

Query 8: List the most recent annual medical examination and his/her union membership number for each traffic controller (Menu option 12 in program)

Please enter menu option:

- (1) List all Airplanes and Model Info
- (2) List all Technician Employee Info
- (3) List all Traffic Controller Employee Info
- (4) List all Test History and Quality Test Info
- (5) Insert a new technician
- (6) Delete an existing airplane from the database.
- (7) Update the expertise of an existing technician.
- (8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
- (9) List all the model numbers that a given technician has the expertise, along with their capacity and weight information.
- (10) List the total number of technicians who are experts in each model.
- (11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
- (12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
- (13) List the total number of tests done by each technician for a given airplane.
- (14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
- (0) Quit

```

12
SSN              UnionNo      FirstName      LastName      MedicalExamDate
-----
241032961        406          Brad          Pitt          04-APR-20
619866062        125          Clemson       Martynev      01-APR-20

```

Query 9: List the total number of tests done by each technician for a given airplane (Menu option 13 in program)

Please enter menu option:

- (1) List all Airplanes and Model Info
- (2) List all Technician Employee Info
- (3) List all Traffic Controller Employee Info
- (4) List all Test History and Quality Test Info
- (5) Insert a new technician
- (6) Delete an existing airplane from the database.
- (7) Update the expertise of an existing technician.
- (8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
- (9) List all the model numbers that a given technician has the expertise, along with their capacity and weight in formation.
- (10) List the total number of technicians who are experts in each model.
- (11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
- (12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
- (13) List the total number of tests done by each technician for a given airplane.
- (14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
- (0) Quit

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SSN -----	FirstName -----	LastName -----	AirplaneNo -----	TotalTests -----
721074426	Alice	Wonderland	999222444	1
264153998	Martina	Velichovsk	111222333	3
170119497	Gia	Do	987543621	2
721074426	Alice	Wonderland	123456789	1

Query 10: List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers (Menu option 14 in program)

Please enter menu option:

- (1) List all Airplanes and Model Info
- (2) List all Technician Employee Info
- (3) List all Traffic Controller Employee Info
- (4) List all Test History and Quality Test Info
- (5) Insert a new technician
- (6) Delete an existing airplane from the database.
- (7) Update the expertise of an existing technician.
- (8) List the details of the technician whose salary is greater than the average of the salary of all technicians.
- (9) List all the model numbers that a given technician has the expertise, along with their capacity and weight in formation.
- (10) List the total number of technicians who are experts in each model.
- (11) List the details (test number, test name, maximum score, etc.) of the FAA tests for a given airplane, sorted by the maximum scores.
- (12) List the most recent annual medical examination and his/her union membership number for each traffic controller.
- (13) List the total number of tests done by each technician for a given airplane.
- (14) List the name of the technician, the registration number of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.
- (0) Quit

[14

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Query 14: List the name of the technician, the registration of the airplane, and the FAA number of those tests done between September 2015 and December 2015, sorted by the FAA numbers.--

FirstName	LastName	AirplaneRegistrationNo	FAANo	TestDat
-----	-----	-----	-----	-----
Martina	Velichovsk	111222333	4421	08-SEP-15

STAGE 5: CONCLUSION

This has been a very interesting and creative project. I learnt how to embed SQL script in a C program, and therefore see the the complexity and practicality of a program that has both the features of a primitive language and a functional language.

However, Oracle Embedded SQL is not perfect, and below is a listing of some limitations I encountered that I believe the programmers at Oracle can improve on:

- 1) Structure Record Pointer: Whenever the cursor fetches a record, it places the record into a structure pointer. I realize that the struct record pointer has to have the exact fields that the cursor fetches, no more and no less. This is inflexible, as I ended up having to design a new struct data type for each query that I attempt to execute, because using an existing struct data type with more fields will generate an error, while designing the SELECT statement to fetch more column than necessary in order to fit in an existing struct data type would cause a waste of memory and a slower run-time for the program. This would be a big hindrance for larger database with millions of rows. However, had the program been more complex, designing a new struct for every potential query is not sustainable either, because it would negatively affect program readability and a slower compile time. Therefore, I believe that Oracle can improve on this by allow for SQL cursor to fetch and place its data values into a struct that has more fields than the number of columns it retrieved.
- 2) Join Operations: I was surprised to find out that Oracle embedded SQL does not support the INNER JOIN, OUTER JOIN, LEFT JOIN and RIGHT JOIN operations. In order to join multiples, I had to use a WHERE clause and match their foreign keys together. This, I believe, should also be improved.
- 3) Group By: The GROUP BY clause in Oracle Embedded SQL also has more limitations than the GROUP BY clause in a SQL. In Oracle Embedded SQL, I can't simply use GROUP BY by specifying the column(s) that I want to group by, but I had to either put all columns specified in the SELECT clause in the GROUP BY clause, or use functions on the columns in the SELECT clause to compress the results of those columns into a single value, such as MIN, MAX or SUM. Although this does not affect program performance, it does affect code readability and I believe that the code would look more elegant if this issue is worked on.

Last but not least, thank you Professor Shyu and her TAs for having taught us!