Answer 1

The following are the main stakeholders in the LAABS system project:

- TEO Hong (Owner)
  Being the owner of the company Mr. Hong is directly affected by all operating activities of the system since all operations effect his finances. Specifically, however, Mr. Hong would be more interested in the inventory management of the system – displaying the availability of his equipment and its repair & maintenance status. Moreover, the final reports generated by the system, including the mechanical checks and services which MR. Hong has to send to the manufacturers as per his agreement and the customer usage to analyse the busiest time of the year, most preferred flight plans, customer satisfaction, and possibly future plans for expansion.

- Customers
  One of the key stakeholders is the general public or tourists that would be interacting with the system to use the services provided by LAABS. Primary interaction would be with the booking module and background checking module of the system to ensure all requirements are met for a safe and enjoyable flight experience. They will also rely on the system to remind them of their flights promptly. The system should be easy to use and learn for them and these are the members that the system will be targeting.

- Pilot and Staff members
  This group of users will be directly affected by the system as well. The flight schedules will inform these people of their jobs and will help in better work management. They depend on the system for ensuring their proper training and fitness levels for safe flights. The system will also remind the staff for their medical check-ups regularly.

- Service Engineers (Flight Inspection)
  These stakeholders are responsible for the checking and maintenance of the flying equipment including the balloon and the carriage. These people will log into the system on a daily basis and report on the physical integrity of the equipment, its control systems and cleanliness. They will depend on the system to see the maintenance history of all equipment and report if any balloon is due for service.

- Manufacturers
  The manufacturers are also indirectly affected by the system since the balloon mechanism has to be sent back to them after every 3 months or 50 hours of use for repair and maintenance, therefore they are indirectly dependent on the system to keep track of the service history and time period for the mechanism. Furthermore, they expect to receive detailed service reports by the owner (TEO Hong) which are generated by the system.

- Third-party Finance Handler
  This is the organization that will handle the financial aspects of bookings and ticketing of customers. Any proceeds will be handled by these stakeholders; therefore, they will interact with the system for the customer and booking details along with reporting the payment status. The system will also inform them about the passed time regarding the refund policy accordingly.

- Meteorological Department
  This department will also be a stakeholder in the system as they affect a major functioning aspect of the project. The system depends on updates from the department to cancel/postpone flights due to weather conditions. Weather forecast plays a critical role in the operations of the LAABS and this group feeds critical data to the system.

Answer 2

a. Functional requirements:

- The system should display all flight schedules including dates and times.
- The system should display the booking status of all flights.
- The system should send reminder texts to customers a week before and a day before their flight.
- The system should inform the customer of the cancellation of a booked flight due to bad weather a night before.
- The system should ensure that all pilots and staff members have passed a medical within 3 months, otherwise flag them.
- The system should prompt customers for their weights, medical records and a signed statutory declaration, and flag any ineligible passenger.
- The system should maintain logs for the service engineer's inspection at the start and end of every day.
- The system should track and update the service dates of every balloon mechanism.
- The system should flag any balloon overdue for maintenance - if either 3 months have passed or machine has been used for over 50 hours since last service.
- Generate a customer usage report after an assigned time period.

b. Nonfunctional requirements:

- Confidentiality
  The system should protect its user's data, especially since the system asks for personal demographic information such as body weights and medical records. Therefore, the security of this data is very important and should be kept encrypted and secure.

- Efficiency
  The system's response time should be quick and should be able to handle a large number of user requests. Booking requests should not lag, and confirmation of bookings should be conveyed within a few seconds.
- Integrity
  Data held by the system should be constantly backed up, especially booking schedules, staff medical records, and maintenance logs. Incase of an attack or failure, critical information should not be lost.

- Reliability
  The system should continue to perform its designed functions smoothly without error. For example, flagging of overdue equipment or ineligible passengers over recognized parameters should not hinder throughout the life of the system.

- Usability
  The system should be easy to understand and use for the general public. Users should be guided how to perform their desired actions and the system should be responsive.

- Scalability
  The system should consist of a module-based design, so that it can easily be integrated, modified or scaled to future needs, and should not be rigid in its design.

- Interoperability
  It is important for the LAABS system to be able to couple and facilitate its interface with other systems. For instance, the third-party payment handling software or communicating with the meteorological system to gain weather information. Hence, interoperability should be secure and fast.

Answer 3

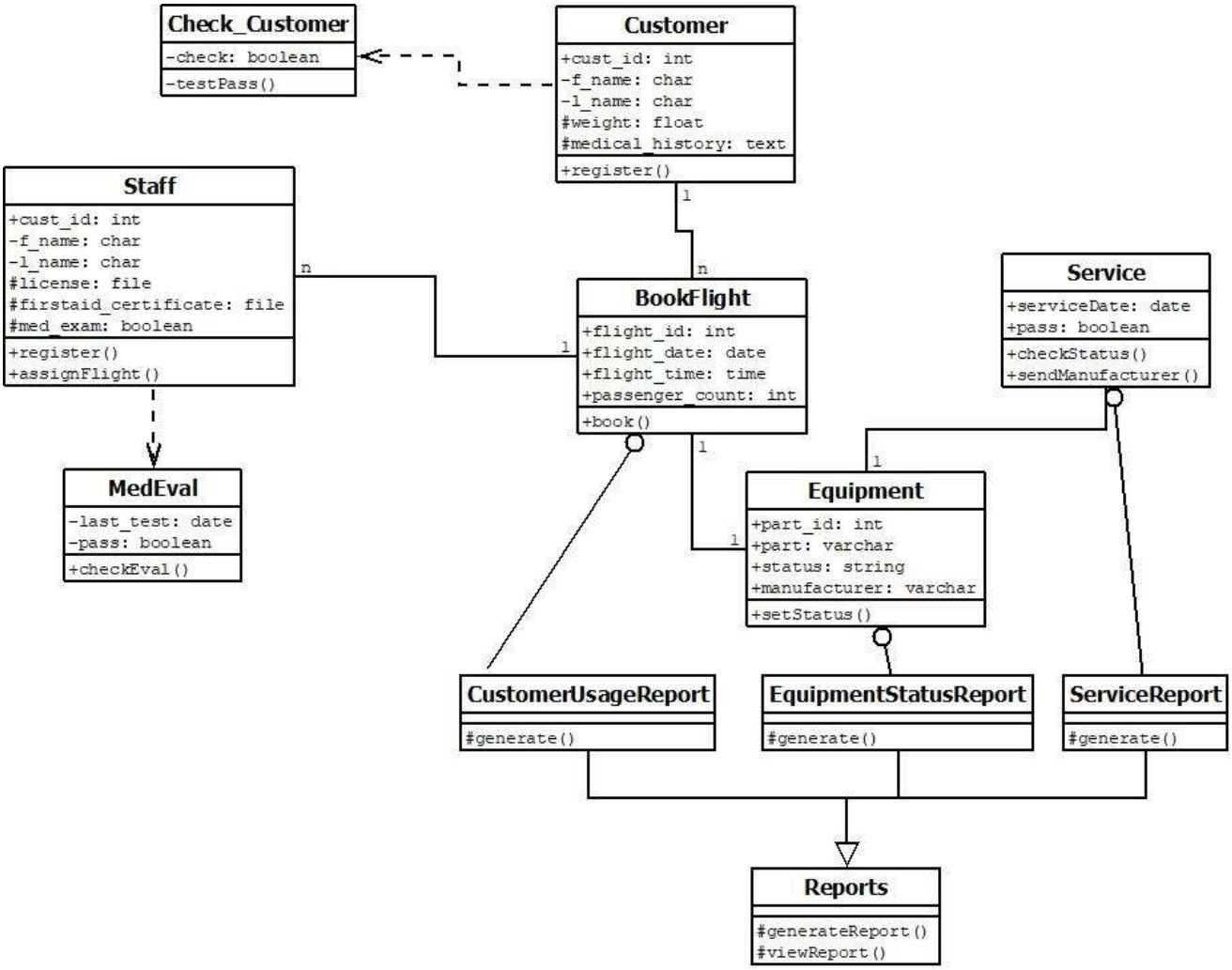
a. User Goal Technique

Participating actors	**Use Case**	**Description**
Customer, pilot, staff member	View flight schedule	Users enter their preferred date/month and the system displays the respective flight schedule.
Customer, staff member	Book a flight	Customers select their choice of date and time and book a ticket.
Staff member, development team	Maintain customer info	The system should store all customer info in respective fields.
Staff member, manager	Register as pilot	System should ask for a Commercial Balloon License, a first aid training certificate and a medical examination.
Service engineer, manager	View maintenance log	The system should display a detailed maintenance log for all machinery along with their date, time-stamp and assigned service engineer.
Staff member	Inspect balloon	Staff member carries out an inspection of the balloon, checking for physical damage, integrity of equipment, balloon control systems, cleanliness, etc. If any of the checks fails, the system records the nature of the failure and issues an alert that the session cannot proceed until it has been rectified. If the checks are all OK, the system records this fact and issues the go-ahead for the session.
Owner, manager, manufacturer	Prepare service report	Prepare a detailed service report of all equipment sent to the manufacturer for any repair/maintenance for a specified time period.
Owner, manager	Prepare equipment status report	The System should create a report showing the status of all current equipment, whether it is in use, or sent for repair, its expected return.
Owner	Prepare customer usage report	System should show all customer usage data i.e. flights booked, dates of flights, busiest times of the year.

b. Event Decomposition Technique

Event	Type of event	Trigger	Use case	Description
Confirm whether given customer can book a flight	state	Customer registers their information, including weight, medical records etc.	Verify eligibility of customers	The weights, and medical details of customers will be checked to check if they are eligible to fly.
Remind staff member to renew medical evaluation	temporal	More than 3 months pass since a staff member's medical evaluation.	Flag staff member	If more than 3 months have passed since a staff member's medical evaluation, flag the particular member and prohibit them from service.
Flag equipment to be sent to the manufacturer	temporal	Equipment has not been serviced over 3 months or 50 hours of use	Flag equipment for service	If any equipment is overdue for repair/maintenance i.e. past 3 months or 50 hours of use, the system should flag the equipment to be sent to the manufacturer and prohibit use of equipment.

Answer 4


Check_Customer
-check: boolean
-testPass()
Customer
+cust_id: int
-f_name: char
-l_name: char
#weight: float
#medical_history: text
+register()
Staff
+cust_id: int
-f_name: char
-l_name: char
#license: file
#firstaid_certificate: file
#med_exam: boolean
+register()
+assignFlight()
BookFlight
+flight_id: int
+flight_date: date
+flight_time: time
+passenger_count: int
+book()
Service
+serviceDate: date
+pass: boolean
+checkStatus()
+sendManufacturer()
MedEval
-last_test: date
-pass: boolean
+checkEval()
Equipment
+part_id: int
+part: varchar
+status: string
+manufacturer: varchar
+setStatus()
CustomerUsageReport
#generate()
EquipmentStatusReport
#generate()
ServiceReport
#generate()
Reports
#generateReport()
#viewReport()
1
n
n
1
1
1
1
n

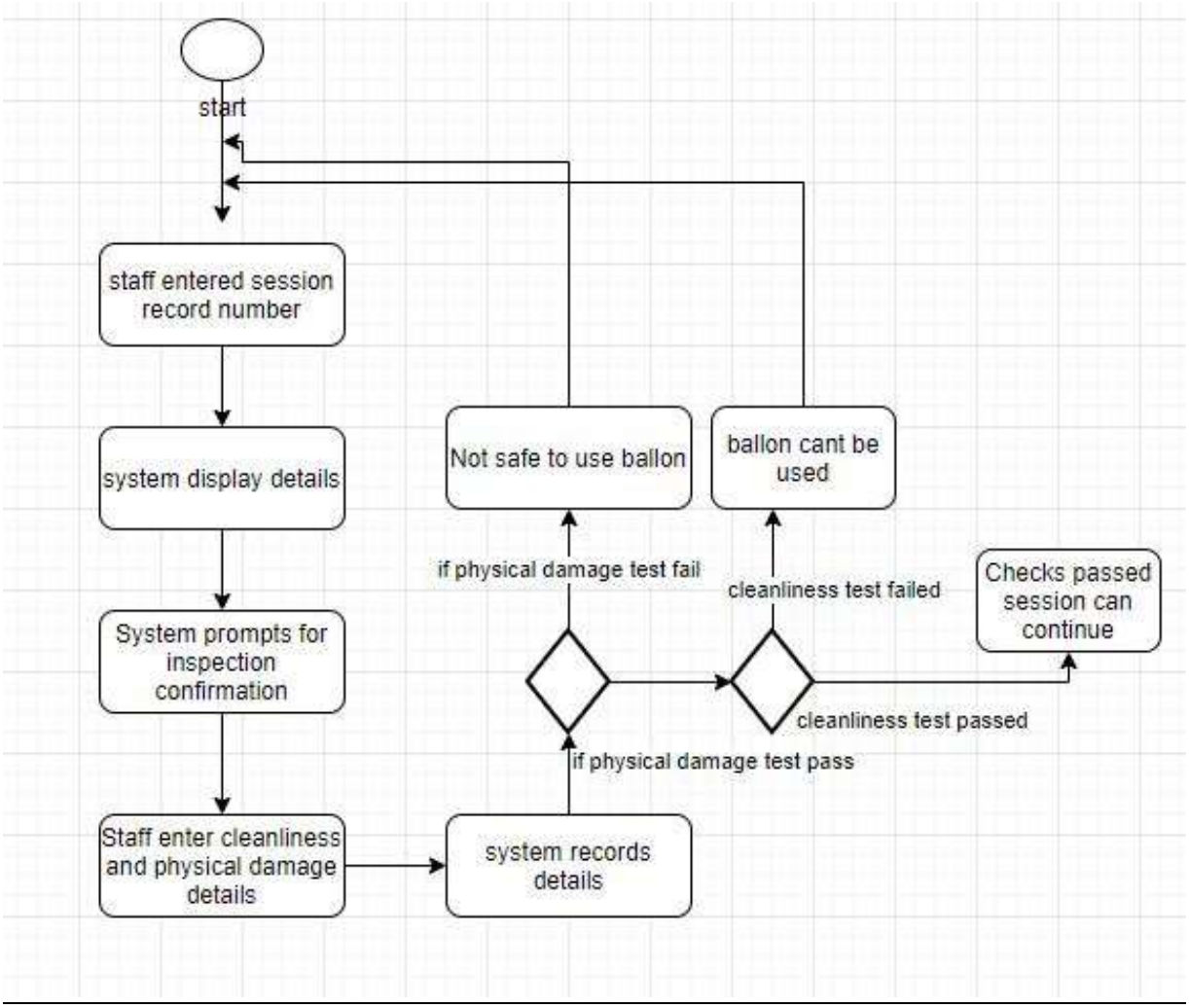
Answer 5

	Book_Flight	Customer	Check_Customer	Staff	MedEval	Equipment	Service	Reports
View flight schedule	RU	R		CUD				
Book a flight	U	U		CD				R
Maintain customer info	R	C	U	D				R
Register as pilot				C	UD			
View maintenance log				CU		R		R
Inspect balloon				CU		R	U	R
Prepare service report						R	R	CU
Prepare equipment status report	R					R	R	CU
Prepare customer usage report		R						CU
Verify eligibility of customers	U	R	R					
Flag staff member				U	R			
Flag equipment for service	U					R	R	

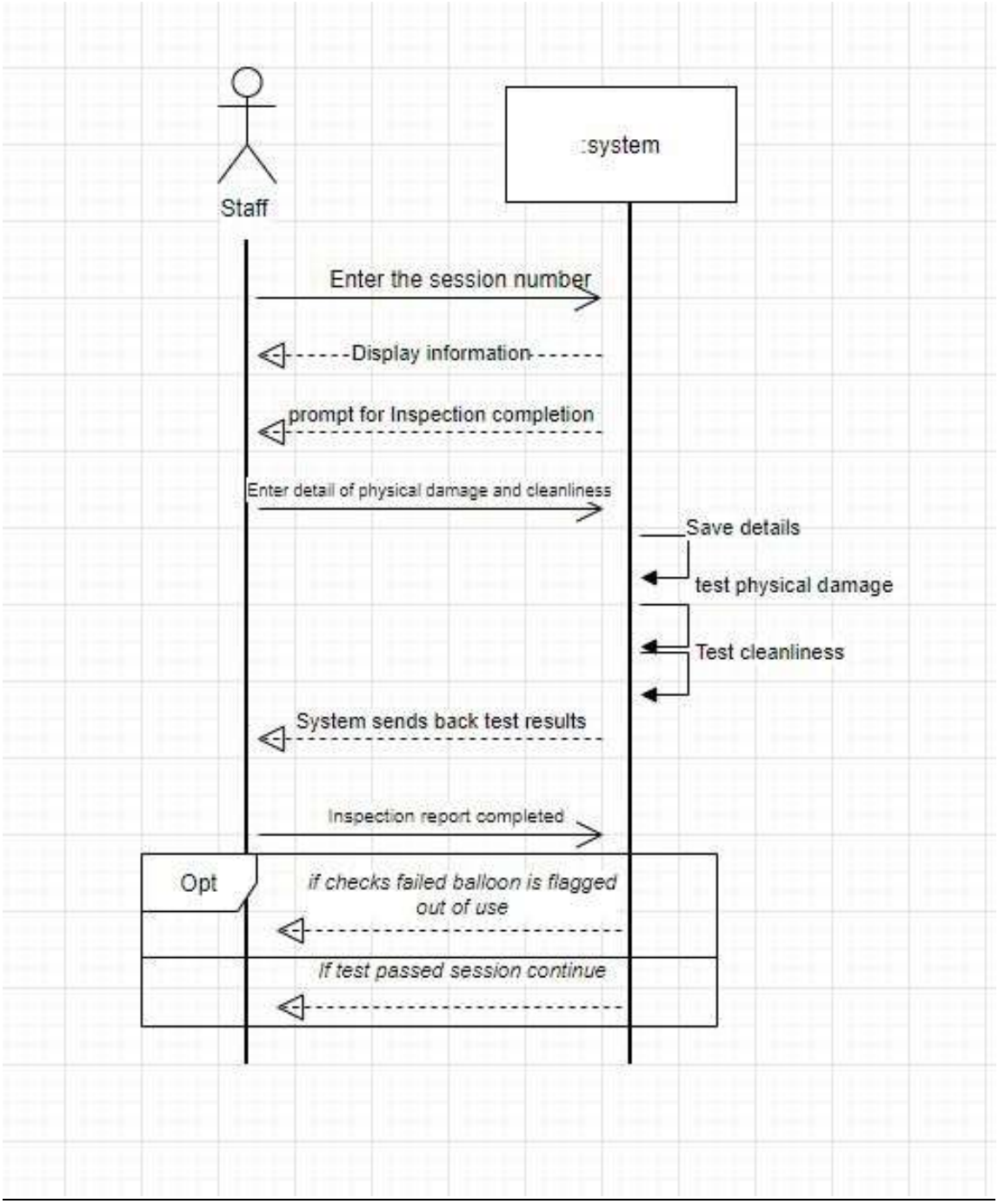
Answer 6

Use Case Name	Book a Flight	
Scenario	Customer wants to book a flight	
Triggering Event	Send Notifications to Customer, creating boarding pass, check-in, safety briefing, balloon inflating	
Brief Description	A customer has to book a flight using LAABS online system, lights are only booked out in lots of ten (10) (small balloons) or twenty (20) (large balloons).	
Actor	Customer	
Stakeholders	Customer, Pilot, Co-Pilot, Owner	
Preconditions	User has subscription and Technical check physical damage, integrity of equipment, balloon control systems, cleanliness	
Post Conditions	post-flight breakfast, champagne and photo opportunities with the (inflated) balloon and pilot.	
Flow of Activities	**Actor**	**System**
	Enter name, address, and contact phone number Demand number of balloons Sign a Statutory Declaration Pay loan for warm Jacket	Confirm these arguments And add on a boarding pass Explain available number of balloons Check the provided information is true or not Calculate loan for jacket according to flight time
Exception Cases	Flight can be cancelled because of Customer illness Demands of balloons can be exceeded	

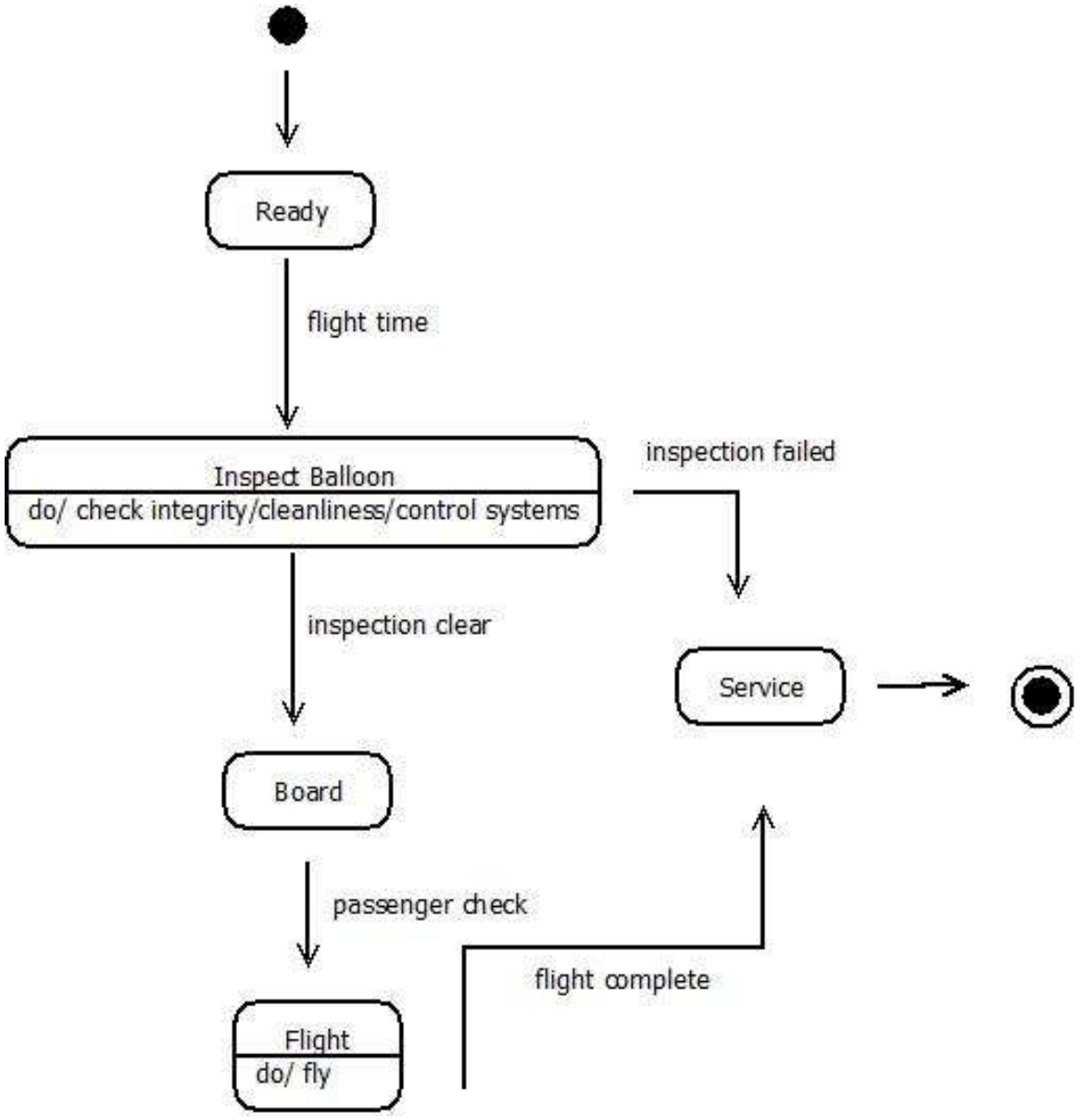
Answer 7


start
staff entered session record number
system display details
System prompts for inspection confirmation
Staff enter cleanliness and physical damage details
system records details
if physical damage test pass
if physical damage test fail
Not safe to use ballon
cleanliness test failed
ballon cant be used
cleanliness test passed
Checks passed session can continue

Answer 8


Staff
:system
Enter the session number
Display information
prompt for Inspection completion
Enter detail of physical damage and cleanliness
Save details
test physical damage
Test cleanliness
System sends back test results
Inspection report completed
Opt
if checks failed balloon is flagged out of use
If test passed session continue

Answer 9


Ready
flight time
Inspect Balloon
do/ check integrity/cleanliness/control systems
inspection failed
inspection clear
Service
Board
passenger check
flight complete
Flight
do/ fly

Answer 10

Use case	Test conditions	Expected Outcomes
View flight schedule	Add flights, update flight schedules, delete flights if cancelled.	A new flight is added with its date and time. Change in a flight' time is updated. If a flight is cancelled (due to weather) it should be deleted.
Book a flight	Select an existing flight, book it using a customer id, update status of flight.	A flight status will change to booked, will consist of a customer id as a reference.
Maintain customer info	Add customer, update customer, delete not allowed.	New customer with all respective fields (name, weight, medical history). Update only selected fields.
Register as pilot	Add a pilot, submit Commercial Balloon License along with a first-aid certificate and pass a medical exam.	Store provided information, and forward it for being processed. If meets criteria – staff member registered as pilot.
View maintenance log	Create a new log, update an existing, delete not allowed	A new log entered, updated at specified times of the day.
Inspect balloon	Display all checks necessary, update checks, delete not allowed.	All checks fulfilled – balloon passed for inspection.
Prepare service report	Create a new report, update report, delete not allowed	Report created and displayed using required information from the system.
Prepare equipment status report	Create a new report, update report, delete not allowed	Report created and displayed using required information from the system.
Prepare customer usage report	Create a new report, update report, delete not allowed	Report created and displayed using required information from the system.
Verify eligibility of customers	Process weight and medical condition of customers.	If inputs meet criterion, forward a true condition to customer booking flight.
Flag staff member	Process the time since staff member's last medical evaluation.	If medical evaluation overdue, issue a warning to the staff member.
Flag equipment for service	Process the time since equipment's last service log.	If service overdue, flag equipment, send update to flight booking.