*Schedule*

*scheduleId*: ℙ *SCHEDULEID*

*departDestination*: *SCHEDULEID* ⇸ *DESTINATION*

*arrivalDestination*: *SCHEDULEID* ⇸*DESTINATION*

*departTime*: *SCHEDULEID* ⇸ *TIME*

*arrivalTime*: *SCHEDULEID* ⇸ *TIME*

*scheduleDate*: *SCHEDULEID* ⇸ *DATE*

*scheduleStatus*: *SCHEDULEID*⇸ *SCHEDULESTATUS*

*frequency*: *SCHEDULEID* ⤀ *FREQUENCY*

*daySchedule*: *SCHEDULEID* ⇸ *DAYSCHEDULE*

*numOfLayover*: *SCHEDULEID* ⇸ℕ

*routePrice*: *SCHEDULEID* ⇸ℕ

*onBoard*: *SCHEDULEID* ↣ℕ

*aircraftId*: *SCHEDULEID* ⤔ *AIRCRAFTID*

*departDestination*≠ *arrivalDestination*

*routePrice* > *minPrice*

*departTime* ≠ *arrivalTime*

*dom departDestination* = *dom arrivalDestination* =*dom departTime* =*dom arrivalTime*

= *dom scheduleDate* = *dom frequency* = *dom daySchedule* =*dom numOfLayover*

= *dom routePrice* = *dom onBoard* = *dom aircraftId* = *scheduleId*

*Aircraft*

*aircraftId*: ℙ *AIRCRAFTID*

*aircraftName*: *AIRCRAFTID* ⇸ *AIRCRAFTNAME*

*aircraftType*: *AIRCRAFTID* ⇸ *AIRCRAFTTYPE*

*cabinClass*: *AIRCRAFTID* ⇸ *CABINCLASS*

*capacity*: *AIRCRAFTID* ↣ℕ

*aircraftStatus*: *AIRCRAFTID* ⇸ *AIRCRAFTSTATUS*

*dayOfOperation*: *AIRCRAFTID* ⤔ *DAYOFOPERATION*

*dom aircraftName* = *dom aircraftName* = *aircraftType* = *cabinClass* = *capacity* = *aircraftStatus*=

*dayOfOperation* = *aircraftId*

**Basic Type**

[FLIGHTID] - the set of all flight ID

[SCHEDULEID] -the set of all Schedule ID

[AIRCRAFTID] -the set of all aircraft ID

[DESTINATION] -the set of all destination

**Free Types**

FREQUENCY::= daily | weekly | monthly

DAYOFOPERATION::= monday | tuesday | wednesday | thursday | friday | saturday | sunday

AIRCRAFTSTATUS::= in\_service | under\_maintenance

CABINCLASS::= economy | premium\_economy | business | first Class

FLIGHTSTATUS: : = on\_time | delayed | cancelled

AIRCRAFTTYPE ::= airAsia | batik\_air | citilink | hahn\_air | jetstart\_asia\_airways | singapore

SCHEDULESTATUS::= active | cancelled | completed | ongoing | upcoming

*InitSchedule*

*Schedule*

*scheduleId* = ∅

*departDestination*= ∅

*arrivalDestination*= ∅

*departTime*= ∅

*arrivalTime*= ∅

*scheduleDate*= ∅

*frequency*= ∅

*daySchedule*= ∅

*numOfLayover*= ∅

*routePrice*= ∅

*onBoard*= ∅

*aircraftId* = ∅

*InitFlight*

*Flight*

*flightId* =∅

*time* =∅

*flightStatus* =∅

*gateAssignment* =∅

*disruptionHandling* =∅

*scheduleId* =∅

*InitAircraft*

*AirCraft*

*aircraftId*=∅

*aircraftType*=∅

*aircraftName*=∅

*cabinClass*=∅

*capacity*=∅

*aircraftStatus*=∅

*dayOfOperation* =∅

*minPrice*: ℕ

*onBoard*: ℕ

*minPrice* > 0

*onBoard* =0

**Operation Schema**

**AIRCRAFT TABLE**

*CreateAircraft*

Δ*AirCraft*

Ξ*Account*

*aircraft*?: *AIRCRAFTID*

*name*?: *AIRCRAFTNAME*

*type*?: *AIRCRAFTTYPE*

*cabin*?: *CABINCLASS*

*seat*?: *CAPACITY*

*status*?: *AIRCRAFTSTATUS*

*day*?: *DAYOFOPERATION*

*accountId*?: *ACCOUNTID*

*aircraft*? ∉ *aircraftId*

*role accountId*?= *staff*

*aircraftId* ′= *aircraftId* ∪{*aircraft*?}

*aircraftName* ′=aircraftName ∪ { *aircraft*?↦*name*?}

*aircraftType* ′= *aircraftType*∪{ *aircraft*?↦*type*?}

*cabinClass*′= *cabinClass* ∪ { *aircraft*?↦*cabin*?}

*capacity* ′= *capacity* ∪{ *aircraft*?↦*seat*?}

*aircraftStatus*′= *aircraftStatus* ∪{ *aircraft*?↦*status*?}

*dayOfOperation*′= *dayOfOperation* ∪{*aircraft* ↦*day*? }

*RemoveAircraft*

Δ *Aircraft*

Ξ *Schedule*

*aircraft*?: *AIRCRAFTID*

*accountId*?: *ACCOUNTID*

*aircraft*? ∈ *aircraftId*

#*aircraftId*▷{*aircraft*?}=0

*role accountId*?= *staff*

*aircraftId*′= *aircraftId* ∖ {*aircraft*?}

*aircraftName* ′= {*aircraft*?} ⩤ *aircraftName*

*aircraftType* ′={*aircraft*?} ⩤ *aircraftType*

*cabinClass*′= {*aircraft*?} ⩤ *cabinClass*

*capacity* ′={*aircraft*?} ⩤ *capacity*

*aircraftStatus*′={*aircraft*?} ⩤ *aircraftStatus*

*dayOfOperation*′= {*aircraft*?} ⩤ *dayOfOperation*

*UpdateAircraftStatus*

Δ*Aircraft*

Ξ*Schedule*

*aircraft* ?: *AIRCRAFTID*

*name*?: *AIRCRAFTNAME*

*status*?: *AIRCRAFTSTATUS*

*type*?: *AIRCRAFTYPE*

*class*?: *CABINCLASS*

*seatNum*?: ℕ

*dayOperate*?: *DAYOFOPERATION*

*accountId*?: *ACCOUNTID*

*aircraft*? ∈ *aircraftId*

*role accountId*?= *staff*

(*scheduleStatus*(*aircraft*?)= *completed* ∨(*aircraft*?∉ *ran*(*aircraftId*) ∧ *scheduleStatus*(*aircraft*?)≠*completed*))

*aircraftName*′=*aircraftName* ⊕{*aircraft*? ↦ *name*?}

*aircraftStatus*′=*aircraftStatus* ⊕{*aircraft*?↦ *status*?}

*aircraftType*′=*aircraftType* ⊕{*aircraft*? ↦ *type*?}

*cabinClass*′=*cabinClass*⊕{*aircraft*? ↦ *class*?}

*capacity*′=*capacity* ⊕{*aircraft*? ↦ *seatNum*?}

*dayOfOperation*′=*dayOfOperation* ⊕ {*aircraft*? ↦ *dayOperate*?}

**SCHEDULE TABLE**

*CreateSchedule*

Δ*Schedule*

Ξ*Account*

Ξ*Aircraft*

*schedule*?: *SCHEDULEID*

*departDest*?: *DESTINATION*

*arrivalDest*?: *DESTINATION*

*depaTime*?, *arriTime*?: *TIME*

*date*?, *today*? : *DATE*

*freq*?: *FREQUENCY*

*day*?: *DAYSCHEDULE*

*layover*?, *price*?: ℕ

*aircraft*?: *AIRCRAFTID*

*accountId*?: *ACCOUNTID*

*schedule* ∉ *scheduleId*

*aircraft*?∈ *aircrafId*

*role accountId*?= *staff*

*arriTime*?≠ *depaTime*?

*departDest*?≠ *arrivalDest*?

*date*? > *today*? -3

*day*?= *ran*(*dayOfOperation* ▷{*aircraft*?})

*price*>*minPrice*

*scheduleId*′= *scheduleId* ∪{*schedule*?}

*departDestination*′= *departDestination* ∪{*schedule*?↦ *departDest*?}

*arrivalDestination* ′=*arrivalDestination* ∪{*schedule*?↦ *arrivalDest*?}

*departureTime*′=*depatureTime* ∪{*schedule*? ↦ *departTime*?}

*arrivalTime*′= *arrivalTime* ∪{*schedule*? ↦ *arrTime*?}

*scheduleDate*′= *scheduleDate* ∪{*schedule*? ↦ *date*?}

*frequency*′= *frequency* ∪{*schedule*?↦ *freq*?}

*daySchedule*′= *daySchedule* ∪ {*schedule*? ↦ *day*?}

*numOfLayover*′= *numOfLayover* ∪{*schedule*? ↦ *layover*?}

*routePrice*′= *routePrice* ∪{*schedule*? ↦ *price*?}

*onBoard*′= *onBoard*

*aircraftId*′= *aircraftId* ∪{*schedule*? ↦ *aircraft*?}

*ChangeSchedule*

Δ *Schedule*

Ξ*Account*

Ξ *Aircraft*

Ξ *Passenger*

*schedule?: SCHEDULEID*

*depaTime?, arriTime?: TIME*

*today? : DATE*

*freq?: FREQUENCY*

*day?: DAYSCHEDULE*

*layover?, price?: ℕ*

*aircraft?: AIRCRAFTID*

*accountId?: ACCOUNTID*

*schedule*?∈ *scheduleId*

*role accountId*?= *staff*

(*scheduleStatus*(*schedule*?) = *active* ∨ *scheduleStatus*(*schedule*?) = *ongoing*)

*capacity*(*aircraft*?) > *onboard*

*today*? - *scheduleDate*(*aircraft*?) ≥1

*day*?= *ran*(*dayOfOperation* ▷{*aircraft*?})

*depaTime*?≠ *departTime*

*arrTime*?≠ *arrivalTime*

*arriTime*?≠ *depaTime*?

*departDestination* ′=  *departDestination*

*arrivalDestination* ′= *arrivalDestination*

*departTime*′= *departTime* ⊕{*schedule*?↦*depaTime*?}

*arrivalTime*′= *arrivalTime* ⊕{*schedule*? ↦ *arrTime*}

*scheduleDate*′= *scheduleDate*

*scheduleStatus*′= *scheduleStatus*

*frequency*′= *frequency*

*daySchedule*′= *daySchedule*⊕{*schedule*?↦ *day*?}

*numOfLayover*′= *numOfLayover* ⊕{*schedule*? ↦ *layover*?}

*routePrice*′= *routePrice* ⊕{*schedule*? ↦ *price*?}

*onBoard*′= *onBoard*

*aircraftId*′= *aircraftId* ⊕ {*schedule*? ↦*aircraft*?}

*DeleteSchedule*

Δ*Schedule*

Ξ*Account*

*schedule*?: *SCHEDULEID*

*account*?: *ACCOUNTID*

*schedule*? ∈ *scheduleId*

*role accountId*?= *staff*

(*scheduleStatus*(*schedule*?) = *active* ∨ *scheduleStatus*(*schedule*?) = *ongoing*)

*today*? - *scheduleDate*(*aircraft*?) ≥1

*onBoard schedule*? = 0

*departDestination* ′=  *departDestination*

*arrivalDestination* ′= *arrivalDestination*

*departTime*′= *departTime*

*arrivalTime*′= *arrivalTime*

*scheduleDate*′= *scheduleDate*

*scheduleStatus*′= *scheduleStatus* ⊕{*schedule*? ↦ *cancelled*}

*frequency*′= *frequency*

*daySchedule*′= *daySchedule*

*numOfLayover*′= *numOfLayover*

*routePrice*′= *routePrice*

*onBoard*′= *onBoard*

*aircraftId*′= *aircraftId*

*DisplaySchedule*

Ξ *Schedule*

*schedule*,*schedule*!, *schedule*?: *SCHEDULEID*

*accountId*?: *ACCOUNTID*

*departDest*!: *DESTINATION*

*arrivalDest*!: *DESTINATION*

*depaTime*!, *arriTime*!: *TIME*

*date*!, *today*! : *DATE*

*freq*!: *FREQUENCY*

*day*!: *DAYSCHEDULE*

*layover*!, *price*!, *onSeat*: ℕ

*aircraft*, *aircraft*!: *AIRCRAFTID*

*schedule*?∈ *scheduleId*

*role accountId*?= *staff*

*schedule* = *aircraftId*∼⦇{*schedule*?}⦈

*schedule*!= *schedule*

*departDest*= *departDestination schedule*

*arrivalDest*= *arrivalDestination schedule*

*depaTime*!= *departureTime schedule*

*arriTime*!= *arrivalTime schedule*

*date*!= *scheduleId schedule*

*freq*!= *frequency schedule*

*day*!= *daySchedule schedule*

*layover*!= *numOfLayover schedule*

*price*!= *routePrice schedule*

*onSeat*!= *onBoard schedule*

*aircraft*!= *aircraftId schedule*

*departDestination*′= *departDestination*

*arrivalDestination* ′=*arrivalDestination*

*departureTime*′=*depatureTime*

*arrivalTime*′= *arrivalTime*

*scheduleDate*′= *scheduleDate*

*frequency*′= *frequency*

*daySchedule*′= *daySchedule*

*numOfLayover*′= *numOfLayover*

*routePrice*′= *routePrice*

*onBoard*′= *onBoard*

*aircraftId*′= *aircraftId*

**Monthly Aircraft Used Report**

*CheckedAircraftUsed*

Ξ*Schedule*

Ξ*Aircraft*

Ξ*Account*

*accountId*?: *ACCOUNTID*

*startDate*?: *DATE*

*endDate*?: *DATE*

*deDestination*?: *DESTINATION*

*arriDestination*?: *DESTINATION*

*aircraftUsed*!: (*AIRCRAFTID* × *DESTINATION* × *DESTINATION* ×ℕ)

*totalUsed*!:ℕ

*role*(*accountId*?) = *staff*

*startDate*? <*endDate*?

*aircraftUsed* != { *n*: *scheduleId* | (*scheduleDate*(*n*) ≥ *startDate*? ∧ *scheduleDate*(*n*) ≤ *endDate*?) ∧

(*departDestination*(*n*)=*deDestination*? ∧ arrival*Destination*(*n*)=*arriDestination*?)

⦁*a*=*aircraftId*(*n*) ∧*depart*=*departDestination*(*n*) ∧ *arrival*=*arrivalDestination*(*n*)∧

*totalUsed*=#*ran*({*n*}◁*aircraftId*)}

*scheduleId*′= *scheduleId*

*departDestination* ′=  *departDestination*

*arrivalDestination* ′= *arrivalDestination*

*departTime*′= *departTime*

*arrivalTime*′= *arrivalTime*

*scheduleDate*′= *scheduleDate*

*scheduleStatus*′= *scheduleStatus*

*frequency*′= *frequency*

*daySchedule*′= *daySchedule*

*numOfLayover*′= *numOfLayover*

*routePrice*′= *routePrice*

*onBoard*′= *onBoard*

*aircraftId*′= *aircraftId*

*SearchRoutes*

Ξ*Schedule*

Ξ*Aircraft*

*from*?: *DESTINATION*

*to*?: *DESTINATION*

*departDate*?: *DATE*

*departingFlight*!: (*SCHEDULEID* × *TIME* × *TIME* ×ℕ×ℕ × *CABINCLASS* × *AIRCRAFTTYPE*)

*from*?≠ *to*?

*departingFlight*!= *schedule*: *scheduleId*; *depart*: *ran*(*departTime*) ; *arrival*: *ran*(*arrivalTime*) ;

*price*: *ran*(*routePrice*) ; *layover*: *ran*(*numOfLayover*) ; *class*: *ran*(*cabinClass*);

*type*: *ran*(*aircraftType*)| *departDate*?= *scheduleDate*(*schedule*) ∧

*departDestination*(*schedule*) = *from*? ∧ *arrivalDestination*(*schedule*)= *to*? ∧

*depart* = *departTime*(*schedule*) ∧*arrival* = *arrivalTime*(*schedule*)

∧

*price*= *routePrice*(*schedule*)

∧

*layover*= *numOfLayover*(*schedule*)

∧

*class*= *cabinClass*((*ran*({*schedule*} ▷ *aircraftId*))

∧

*type* = *aircraftType*(*ran*({*schedule*} ▷ *aircraftId*)

*scheduleId*′= *scheduleId*

*departDestination* ′=  *departDestination*

*arrivalDestination* ′= *arrivalDestination*

*departTime*′= *departTime*

*arrivalTime*′= *arrivalTime*

*scheduleDate*′= *scheduleDate*

*scheduleStatus*′= *scheduleStatus*

*frequency*′= *frequency*

*daySchedule*′= *daySchedule*

*numOfLayover*′= *numOfLayover*

*routePrice*′= *routePrice*

*onBoard*′= *onBoard*

*aircraftId*′= *aircraftId*

|  |  |  |  |
| --- | --- | --- | --- |
| Schema Name | Pre-conditions for success | Pre-condition for Failure | Remark |
| Create Schedule | *Schedule*?∉ *scheduleId* | *Schedule*?∈ *scheduleId* | scheduleExisted |
| *aircraft*?∈ *aircrafId* | *aircraft*?∉ *aircrafId* | aircraftNotExisted |
| *role accountId*?= *staff* | *role accountId*?≠ *staff* | roleIncorrect |
| *arriTime*?≠ *depaTime*? | *arriTime*?= *depaTime*? | sameTime |
| *departDest* ≠ *arrivalDest* | *departDest* = *arrivalDest* | sameDestination |
| *date*? > *today*? -3 | *date*? < *today*? -3 | lateSchedule |
| *day*?=*ran*(*dayOfOperation*  ▷{*aircraft*?}) | *day*?≠*ran*(*dayOfOperation*  ▷{*aircraft*?}) | InequalAircraftOperation |
| *price*>*minPrice* | *Price*<*minPrice* | notReachingMinimumPrice |
| Change Schedule | *schedule*?∈ *scheduleId* | *schedule*?∉ *scheduleId* | scheduleNotExisted |
| *role accountId*?= *staff* | *role accountId*?≠ *staff* | roleIncorrect |
| (*scheduleStatus*(*schedule*?) =  *active* ∨(*scheduleStatus*(*schedule*?) =  =*ongoing* | (*scheduleStatus*(*schedule*?) ≠  *active* ∨(*scheduleStatus*(*schedule*?) =  ≠*ongoing* | incorrectScheduleStatus |
| *capacity*(*aircraft*?) >*onboard* | *capacity*(*aircraft*?) < *onboard* | exceedOnboard |
| *today*?- *scheduleDate*(*aircraft*?)≥1 | *today*?- *scheduleDate*(*aircraft*?)≤1 | lateChangeSchedule |
| *day*?=*ran*(*dayOfOperation*  ▷{*aircraft*?}) | *day*?≠*ran*(*dayOfOperation*  ▷{*aircraft*?}) | inequalAircraftOperation |
| *depaTime*?≠ *departTime* | *depaTime*?= *departTime* | equalDepartureTime |
| *arriTime*? ≠ *arrivalTime* | *arriTime*? = *arrivalTime* | equalArrivalTime |
| *arriTime*?≠ *depaTime*? | *arriTime*?= *depaTime*? | sameTime |
| Delete Schedule | *schedule*?∈ *scheduleId* | *schedule*?∉ *scheduleId* | scheduleNotExisted |
| *role accountId*?= *staff* | *role accountId*?≠ *staff* | roleIncorrect |
| (*scheduleStatus*(*schedule*?) =  *active* ∨(*scheduleStatus*(*schedule*?) =  =*ongoing* | (*scheduleStatus*(*schedule*?) ≠  *active* ∨(*scheduleStatus*(*schedule*?) =  ≠*ongoing* | incorrectScheduleStatus |
| *today*?- *scheduleDate*(*aircraft*?)≥1 | *today*?- *scheduleDate*(*aircraft*?)≤1 | lateChangeSchedule |
| *onBoard schedule*? =0 | *onBoard schedule*?≠0 | passengerExists |
| DisplaySchedule | *schedule*?∈ *scheduleId* | *schedule*?∉ *scheduleId* | scheduleNotExisted |
| *role accountId*?= *staff* | *role accountId*?≠ *staff* | roleIncorrect |
| CheckedAircraftUsed | *role*(*accountId*?) = *staff*  *startDate*? <*endDate*? | *role*(*accountId*?) ≠ *staff*  *startDate*? > *endDate*? | roleIncorrect  IncorrectDateFormat |
| SearchRoutes | *from*? ≠ *to*? | *from*? = *to*? | equalDestination |

*Success*

*rep*!: *RESPONSE*

*rep*!: *sucess*

*CreateScheduleError*

Δ*Schedule*

Ξ*Account*

Ξ*Aircraft*

*schedule*?: *SCHEDULEID*

*departDest*?: *DESTINATION*

*arrivalDest*?: *DESTINATION*

*depaTime*?, *arriTime*?: *TIME*

*date*?, *today*? : *DATE*

*freq*?: *FREQUENCY*

*day*?: *DAYSCHEDULE*

*layover*?, *price*?: ℕ

*aircraft*?: *AIRCRAFTID*

*accountId*?: *ACCOUNTID*

*rep*!: *MESSAGE*

(*schedule*?∈ *scheduleId* ∧ *rep*!= scheduleExisted)

∨

(*aircraft*?∉ *aircrafId* ∧ *rep*!= aircraftNotExisted)

∨

(*role accountId*?≠ *staff* ∧ *rep*!= roleIncorrect)

∨

(*arriTime*?= *depaTime*? ∧*rep*!=*sameTime*)

∨

(*departDest* = *arrivalDest* ∧ *rep*!= sameDestination)

∨

(*date*? < *today*? -3 ∧ *rep*!= lateSchedule)

∨

(*day*?≠*ran*(*dayOfOperation*)▷{*aircraft*?}) ∧ *rep*!= InequalAircraftOperation)

∨

(*price*<*minPrice* ∧ *rep*!= notReachingMinimumPrice)

*ChangeScheduleError*

Δ *Schedule*

Ξ*Account*

Ξ *Aircraft*

Ξ *Passenger*

*schedule?: SCHEDULEID*

*depaTime?, arriTime?: TIME*

*today? : DATE*

*freq?: FREQUENCY*

*day?: DAYSCHEDULE*

*layover?, price?: ℕ*

*aircraft?: AIRCRAFTID  
accountId?: ACCOUNTID  
rep*!: *MESSAGE*

(*schedule* ∉ *scheduleId* ∧*rep*!= scheduleNot*Existed*)

∨

(*role accountId*?≠ *staff* ∧ *rep*!= roleIncorrect)

∨

(*scheduleStatus*(*schedule*?) ≠ *active* ∨(*scheduleStatus*(*schedule*?) ≠*ongoing* ∧ *rep*!

= incorrectScheduleStatus)

∨

(*capacity*(*aircraft*?) < *onboard* ∧ *rep*!= exceedOnboard)

∨

(*today*?- *scheduleDate*(*aircraft*?)≤1 ∧ *rep*!= lateChangeSchedule)

∨

(*day*?≠*ran*(*dayOfOperation* ▷{*aircraft*?}) ∧ *rep*!= inequalAircraftOperation)

∨

(*depaTime*?= *departTime* ∧ *rep*!= equalDepartureTime)

∨

(*arriTime*? = *arrivalTime* ∧ *rep*!= equalArrivalTime)

∨

(*arriTime*?= *depaTime*? ∧*rep*!=*sameTime*)

*DeleteScheduleError*

Δ*Schedule*

Ξ*Account*

*schedule*?: *SCHEDULEID*

*account*?: *ACCOUNTID*

*rep*!: *MESSAGE*

(*schedule* ∉ *scheduleId* ∧ *rep*!= scheduleNot*Existed*)

∨

(*role accountId*?≠ *staff*∧ *rep*!= roleIncorrect)

∨

(*scheduleStatus*(*schedule*?) ≠ *active* ∨(*scheduleStatus*(*schedule*?) ≠*ongoing* ∧ *rep*!

= incorrectScheduleStatus)

∨

(*today*?- *scheduleDate*(*aircraft*?)≤1 ∧ *rep*!= lateChangeSchedule)

∨

(*onBoard schedule*?≠0 ∧ *rep*!= passengerExists)

*DisplayScheduleError*

Ξ*Schedule*

*schedule*?: *SCHEDULEID*

*rep*!: *MESSAGE*

(*schedule* ∉ *scheduleId* ∧ *rep*!= scheduleNot*Existed*)

∨

(*role accountId*?≠ *staff*∧ *rep*!= roleIncorrect)

*CheckedAircraftUsedError*

Ξ*Schedule*

Ξ*Aircraft*

Ξ*Account*

*accountId*?: *ACCOUNTID*

*startDate*?: *DATE*

*endDate*?: *DATE*

*deDestination*?: *DESTINATION*

*arriDestination*?: *DESTINATION*

*aircraftUsed*!: (*AIRCRAFTID* × *DESTINATION* × *DESTINATION* ×ℕ)

*totalUsed*!:ℕ

*rep*!: *MESSAGE*

(*role*(*accountId*?) ≠ *staff* ∧ *rep*!= *roleIncorrect*)

∨

(*startDate*? > *endDate*? ∧ *rep*!= *incorrectDateFormat*)

*SearchRoutesError*

Ξ*Schedule*

Ξ*Aircraft*

*from*?: *DESTINATION*

*to*?: *DESTINATION*

*departDate*?: *DATE*

*departingFlight*!: (*SCHEDULEID* × *TIME* × *TIME* ×ℕ×ℕ × *CABINCLASS* × *AIRCRAFTTYPE*)

*rep*!: *MESSAGE*

*from*? = *to*? ∧ *rep*!= *equalDestination*

**Complete Schema**

CompleteCreateSchedule ≙ (CreateSchedule ∧ Success) ∨ CreateScheduleError

*CompleteCreateSchedule*

*scheduleId*, *scheduleId*′: ℙ *SCHEDULEID*

*departDestination*, *departDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*arrivalDestination*, *arrivalDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*departTime*, *departTime*′: *SCHEDULEID* ⇸ *TIME*

*arrivalTime*, *arrivalTime*′: *SCHEDULEID* ⇸ *TIME*

*scheduleDate*, *scheduleDate*′: *SCHEDULEID* ⇸ *DATE*

*scheduleStatus*, *scheduleStatus*′: *SCHEDULEID*⇸ *SCHEDULESTATUS*

*frequency*, *frequency*′: *SCHEDULEID* ⤀ *FREQUENCY*

*daySchedule*, *daySchedule*′: *SCHEDULEID* ⇸ *DAYSCHEDULE*

*numOfLayover*, *numOfLayover*′: *SCHEDULEID* ⇸ℕ

*routePrice*:, *routePrice*′ *SCHEDULEID* ⇸ℕ

*onBoard*:, *onBoard*′ *SCHEDULEID* ↣ℕ

*aircraftId*, *aircraftId*′: *SCHEDULEID* ⤔ *AIRCRAFTID*

*schedule*?: *SCHEDULEID*

*departDest*?: *DESTINATION*

*arrivalDest*?: *DESTINATION*

*depaTime*?, *arriTime*?: *TIME*

*date*?, *today*? : *DATE*

*freq*?: *FREQUENCY*

*day*?: *DAYSCHEDULE*

*layover*?, *price*?: ℕ

*aircraft*?: *AIRCRAFTID*

*accountId*?: *ACCOUNTID*

*rep*!: *RESPONSE*

((*schedule* ∉ *scheduleId* ∧ *aircraft*?∈ *aircrafId* ∧ *role accountId*?= *staff*

∧ *departDest* ≠ *arrivalDest* ∧ *date*? > *today*? -3∧

*day*?= *ran*(*dayOfOperation* ▷{*aircraft*?})∧ *price*>*minPrice* ∧

*scheduleId*′= *scheduleId* ∪{*schedule*?} ∧

*departDestination*′= *departDestination* ∪{*schedule*?↦ *departDest*?} ∧

*arrivalDestination* ′=*arrivalDestination* ∪{*schedule*?↦ *arrivalDest*?} ∧

*departureTime*′=*depatureTime* ∪{*schedule*? ↦ *departTime*?} ∧

*arrivalTime*′= *arrivalTime* ∪{*schedule*? ↦ *arrTime*?} ∧

*scheduleDate*′= *scheduleDate* ∪{*schedule*? ↦ *date*?} ∧

*frequency*′= *frequency* ∪{*schedule*?↦ *freq*?} ∧

*daySchedule*′= *daySchedule* ∪ {*schedule*? ↦ *day*?} ∧

*numOfLayover*′= *numOfLayover* ∪{*schedule*? ↦ *layover*?} ∧

*routePrice*′= *routePrice* ∪{*schedule*? ↦ *price*?} ∧

*onBoard*′= *onBoard* ∧ *aircraftId*′= *aircraftId* ∪{*schedule*? ↦ *aircraft*?} ∧ *rep*!=*success*)

∨

(((*schedule*?∈ *scheduleId* ∧ *rep*!= scheduleExisted)

∨

(*aircraft*?∉ *aircrafId* ∧ *rep*!= aircraftNotExisted)

∨

(*role accountId*?≠ *staff* ∧ *rep*!= roleIncorrect)

∨

(*departDest* = *arrivalDest* ∧ *rep*!= sameDestination)

∨

(*date*? < *today*? -3 ∧ *rep*!= lateSchedule)

∨

(*day*?≠*ran*(*dayOfOperation*)▷{*aircraft*?}) ∧ *rep*!= *i*nequalAircraftOperation)

∨

(*price*<*minPrice* ∧ *rep*!= notReachingMinimumPrice))

∧

(*scheduleId*′= *scheduleId* ∧

*departDestination* ′=  *departDestination* ∧

*arrivalDestination* ′= *arrivalDestination* ∧

*departTime*′= *departTime* ∧

*arrivalTime*′= *arrivalTime* ∧

*scheduleDate*′= *scheduleDate* ∧

*scheduleStatus*′= *scheduleStatus* ∧

*frequency*′= *frequency* ∧

*daySchedule*′= *daySchedule* ∧

*numOfLayover*′= *numOfLayover* ∧

*routePrice*′= *routePrice* ∧

*onBoard*′= *onBoard* ∧

*aircraftId*′= *aircraftId*))) ∧

(*departDestination*≠ *arrivalDestination* ∧ *routePrice* > *minPrice* ∧

*departTime* ≠ *arrivalTime* ∧

*dom departDestination* = *dom arrivalDestination* =*dom departTime* =*dom arrivalTime*

= *dom scheduleDate* = *dom frequency* = *dom daySchedule* =*dom numOfLayover*

= *dom routePrice* = *dom onBoard* = *dom aircraftId* = *scheduleId* ^

*dom departDestination*′ = *dom arrivalDestination*′ =*dom departTime*′ =*dom arrivalTime*′

= *dom scheduleDat*′*e* = *dom frequency*′= *dom daySchedule*′ =*dom numOfLayover*′

= *dom routePrice*′= *dom onBoard*′ = *dom aircraftId*′= *scheduleId*′)

ComplateChangeSchedule ≙ (ChangeSchedule ∧ Success) ∨ ChangeScheduleError

*CompleteChangeSchedule*

*scheduleId*, *scheduleId*′: ℙ *SCHEDULEID*

*departDestination*, *departDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*arrivalDestination*, *arrivalDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*departTime*, *departTime*′: *SCHEDULEID* ⇸ *TIME*

*arrivalTime*, *arrivalTime*′: *SCHEDULEID* ⇸ *TIME*

*scheduleDate*, *scheduleDate*′: *SCHEDULEID* ⇸ *DATE*

*scheduleStatus*, *scheduleStatus*′: *SCHEDULEID*⇸ *SCHEDULESTATUS*

*frequency*, *frequency*′: *SCHEDULEID* ⤀ *FREQUENCY*

*daySchedule*, *daySchedule*′: *SCHEDULEID* ⇸ *DAYSCHEDULE*

*numOfLayover*, *numOfLayover*′: *SCHEDULEID* ⇸ℕ

*routePrice*:, *routePrice*′ *SCHEDULEID* ⇸ℕ

*onBoard*:, *onBoard*′ *SCHEDULEID* ↣ℕ

*aircraftId*, *aircraftId*′: *SCHEDULEID* ⤔ *AIRCRAFTID*

*schedule?: SCHEDULEID*

*depaTime?, arriTime?: TIME*

*today? : DATE*

*freq?: FREQUENCY*

*day?: DAYSCHEDULE*

*layover?, price?: ℕ*

*aircraft?: AIRCRAFTID  
accountId?: ACCOUNTID*

(*schedule*?∈ *scheduleId* ∧ *role accountId*?= *staff* ∧

(*scheduleStatus*(*schedule*?) = *active* ∨ *scheduleStatus*(*schedule*?) = *ongoing*) ∧

*capacity*(*aircraft*?) > *onboard* ∧ *today*? - *scheduleDate*(*aircraft*?) ≥1 ∧

*day*?= *ran*(*dayOfOperation* ▷{*aircraft*?}) ∧ *depaTime*?≠ *departTime*

*arrTime*?≠ *arrivalTime* ∧ *arriTime*?≠ *depaTime*? ∧

*departDestination* ′=  *departDestination* ∧ *arrivalDestination* ′= *arrivalDestination* ∧

*departTime*′= *departTime* ⊕{*schedule*?↦*depaTime*?} ∧

*arrivalTime*′= *arrivalTime* ⊕{*schedule*? ↦ *arrTime*} ∧

*scheduleDate*′= *scheduleDate* ∧

*scheduleStatus*′= *scheduleStatus* ∧

*frequency*′= *frequency* ∧

*daySchedule*′= *daySchedule*⊕{*schedule*?↦ *day*?} ∧

*numOfLayover*′= *numOfLayover* ⊕{*schedule*? ↦ *layover*?} ∧

*routePrice*′= *routePrice* ⊕{*schedule*? ↦ *price*?} ∧

*onBoard*′= *onBoard* ∧ *aircraftId*′= *aircraftId* ⊕ {*schedule*? ↦*aircraft*?}∧ *rep*!=*success*)

∨

(((*schedule* ∉ *scheduleId* ∧*rep*!= *scheduleNotExisted*)

∨

(*role accountId*?≠ *staff* ∧ *rep*!= *roleIncorrect*)

∨

(*scheduleStatus*(*schedule*?) ≠ *active* ∨(*scheduleStatus*(*schedule*?) ≠*ongoing* ∧ *rep*!

= *incorrectScheduleStatus*)

∨

(*capacity*(*aircraft*?) < *onboard* ∧ *rep*!= *exceedOnboard*)

∨

(*today*?- *scheduleDate*(*aircraft*?)≤1 ∧ *rep*!= *lateChangeSchedule*)

∨

(*day*?≠*ran*(*dayOfOperation* ▷{*aircraft*?}) ∧ *rep*!= *inequalAircraftOperation*)

∨

(*depaTime*?= *departTime* ∧ *rep*!= *equalDepartureTime*)

∨

(*arriTime*? = *arrivalTime* ∧ *rep*!= *equalArrivalTime*)

∨

(*arriTime*?= *depaTime*? ∧*rep*!=*sameTime*))

∧

(*scheduleId*′= *scheduleId* ∧

*departDestination* ′=  *departDestination* ∧

*arrivalDestination* ′= *arrivalDestination* ∧

*departTime*′= *departTime* ∧

*arrivalTime*′= *arrivalTime* ∧

*scheduleDate*′= *scheduleDate* ∧

*scheduleStatus*′= *scheduleStatus* ∧

*frequency*′= *frequency* ∧

*daySchedule*′= *daySchedule* ∧

*numOfLayover*′= *numOfLayover* ∧

*routePrice*′= *routePrice* ∧

*onBoard*′= *onBoard* ∧

*aircraftId*′= *aircraftId*)))

∧

(*departDestination*≠ *arrivalDestination* ∧ *routePrice* > *minPrice* ∧

*departTime* ≠ *arrivalTime* ∧

*dom departDestination* = *dom arrivalDestination* =*dom departTime* =*dom arrivalTime*

= *dom scheduleDate* = *dom frequency* = *dom daySchedule* =*dom numOfLayover*

= *dom routePrice* = *dom onBoard* = *dom aircraftId* = *scheduleId* ^

*dom departDestination*′ = *dom arrivalDestination*′ =*dom departTime*′ =*dom arrivalTime*′

= *dom scheduleDat*′*e* = *dom frequency*′= *dom daySchedule*′ =*dom numOfLayover*′

= *dom routePrice*′= *dom onBoard*′ = *dom aircraftId*′= *scheduleId*′)

CompleteDeleteSchedule ≙ (DeleteSchedule ∧ Success) ∨ DeleteScheduleError

*CompleteDeleteSchedule*

*scheduleId*, *scheduleId*′: ℙ *SCHEDULEID*

*departDestination*, *departDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*arrivalDestination*, *arrivalDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*departTime*, *departTime*′: *SCHEDULEID* ⇸ *TIME*

*arrivalTime*, *arrivalTime*′: *SCHEDULEID* ⇸ *TIME*

*scheduleDate*, *scheduleDate*′: *SCHEDULEID* ⇸ *DATE*

*scheduleStatus*, *scheduleStatus*′: *SCHEDULEID*⇸ *SCHEDULESTATUS*

*frequency*, *frequency*′: *SCHEDULEID* ⤀ *FREQUENCY*

*daySchedule*, *daySchedule*′: *SCHEDULEID* ⇸ *DAYSCHEDULE*

*numOfLayover*, *numOfLayover*′: *SCHEDULEID* ⇸ℕ

*routePrice*:, *routePrice*′ *SCHEDULEID* ⇸ℕ

*onBoard*:, *onBoard*′ *SCHEDULEID* ↣ℕ

*aircraftId*, *aircraftId*′: *SCHEDULEID* ⤔ *AIRCRAFTID*

*aircraft*?: *AIRCRAFTID*

*accountId*?: *ACCOUNTID*

*rep*!: *RESPONSE*

((*schedule*? ∈ *scheduleId* ∧ *role accountId*?= *staff* ∧

(*scheduleStatus*(*schedule*?) = *active* ∨ *scheduleStatus*(*schedule*?) = *ongoing*) ∧

*today*? - *scheduleDate*(*aircraft*?) ≥1 ∧ *onBoard schedule*? = 0 ∧*rep*!=*RESPONSE*)

∨

(((*schedule* ∉ *scheduleId* ∧ *rep*!= scheduleNot*Existed*)

∨

(*role accountId*?≠ *staff*∧ *rep*!= roleIncorrect)

∨

(*scheduleStatus*(*schedule*?) ≠ *active* ∨(*scheduleStatus*(*schedule*?) ≠*ongoing* ∧ *rep*!

= incorrectScheduleStatus)

∨

(*today*?- *scheduleDate*(*aircraft*?)≤1 ∧ *rep*!= lateChangeSchedule)

∨

(*onBoard schedule*?≠0 ∧ *rep*!= passengerExists))

∧

(*scheduleId*′= *scheduleId* ∧

*departDestination* ′=  *departDestination* ∧

*arrivalDestination* ′= *arrivalDestination* ∧

*departTime*′= *departTime* ∧

*arrivalTime*′= *arrivalTime* ∧

*scheduleDate*′= *scheduleDate* ∧

*scheduleStatus*′= *scheduleStatus* ∧

*frequency*′= *frequency* ∧

*daySchedule*′= *daySchedule* ∧

*numOfLayover*′= *numOfLayover* ∧

*routePrice*′= *routePrice* ∧

*onBoard*′= *onBoard* ∧

*aircraftId*′= *aircraftId*)))

∧

(*departDestination*≠ *arrivalDestination* ∧ *routePrice* > *minPrice* ∧

*departTime* ≠ *arrivalTime* ∧

*dom departDestination* = *dom arrivalDestination* =*dom departTime* =*dom arrivalTime*

= *dom scheduleDate* = *dom frequency* = *dom daySchedule* =*dom numOfLayover*

= *dom routePrice* = *dom onBoard* = *dom aircraftId* = *scheduleId* ^

*dom departDestination*′ = *dom arrivalDestination*′ =*dom departTime*′ =*dom arrivalTime*′

= *dom scheduleDat*′*e* = *dom frequency*′= *dom daySchedule*′ =*dom numOfLayover*′

= *dom routePrice*′= *dom onBoard*′ = *dom aircraftId*′= *scheduleId*′)

CompleteDisplaySchedule ≙ (DipslaySchedule ∧ success) ∨ displayScheduleError

*CompleteDisplaySchedule*

*scheduleId*, *scheduleId*′: ℙ *SCHEDULEID*

*departDestination*, *departDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*arrivalDestination*, *arrivalDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*departTime*, *departTime*′: *SCHEDULEID* ⇸ *TIME*

*arrivalTime*, *arrivalTime*′: *SCHEDULEID* ⇸ *TIME*

*scheduleDate*, *scheduleDate*′: *SCHEDULEID* ⇸ *DATE*

*scheduleStatus*, *scheduleStatus*′: *SCHEDULEID*⇸ *SCHEDULESTATUS*

*frequency*, *frequency*′: *SCHEDULEID* ⤀ *FREQUENCY*

*daySchedule*, *daySchedule*′: *SCHEDULEID* ⇸ *DAYSCHEDULE*

*numOfLayover*, *numOfLayover*′: *SCHEDULEID* ⇸ℕ

*routePrice*:, *routePrice*′ *SCHEDULEID* ⇸ℕ

*onBoard*:, *onBoard*′ *SCHEDULEID* ↣ℕ

*aircraftId*, *aircraftId*′: *SCHEDULEID* ⤔ *AIRCRAFTID*

*schedule*,*schedule*!, *schedule*?: *SCHEDULEID*

*accountId*?: *ACCOUNTID*

*departDest*!: *DEPARTUREDESTINATION*

*arrivalDest*!: *ARRIVALDESTINATION*

*depaTime*!, *arriTime*!: *TIME*

*date*!, *today*! : *DATE*

*freq*!: *FREQUENCY*

*day*!: *DAYSCHEDULE*

*layover*!, *price*!, *onSeat*: ℕ

*aircraft*, *aircraft*!: *AIRCRAFTID*

*rep*!: *RESPONSE*

((*schedule*?∈ *scheduleId* ∧*role accountId*?= *staff* ∧*schedule* = *aircraftId*∼⦇{*schedule*?}⦈ ∧

*schedule*!= *schedule* ∧ *departDest*= *departDestination schedule* ∧

*arrivalDest*= *arrivalDestination schedule* ∧ *depaTime*!= *departureTime schedule* ∧

*arriTime*!= *arrivalTime schedule* ∧ *date*!= *scheduleId schedule* ∧ *freq*!= *frequency schedule* ∧

*day*!= *daySchedule schedule* ∧ *layover*!= *numOfLayover schedule* ∧ *price*!= *routePrice schedule*

∧*onSeat*!= *onBoard schedule* ∧*aircraft*!= *aircraftId schedule* ∧ *rep*!=*success*)

∨

(((*schedule* ∉ *scheduleId* ∧ *rep*!= scheduleNot*Existed*)

∨

(*role accountId*?≠ *staff*∧ *rep*!= roleIncorrect))

∧

(*scheduleId*′= *scheduleId* ∧

*departDestination* ′=  *departDestination* ∧

*arrivalDestination* ′= *arrivalDestination* ∧

*departTime*′= *departTime* ∧

*arrivalTime*′= *arrivalTime* ∧

*scheduleDate*′= *scheduleDate* ∧

*scheduleStatus*′= *scheduleStatus* ∧

*frequency*′= *frequency* ∧

*daySchedule*′= *daySchedule* ∧

*numOfLayover*′= *numOfLayover* ∧

*routePrice*′= *routePrice* ∧

*onBoard*′= *onBoard* ∧

*aircraftId*′= *aircraftId*)))

∧

(*departDestination*≠ *arrivalDestination* ∧ *routePrice* > *minPrice* ∧

*departTime* ≠ *arrivalTime* ∧

*dom departDestination* = *dom arrivalDestination* =*dom departTime* =*dom arrivalTime*

= *dom scheduleDate* = *dom frequency* = *dom daySchedule* =*dom numOfLayover*

= *dom routePrice* = *dom onBoard* = *dom aircraftId* = *scheduleId* ^

*dom departDestination*′ = *dom arrivalDestination*′ =*dom departTime*′ =*dom arrivalTime*′

= *dom scheduleDat*′*e* = *dom frequency*′= *dom daySchedule*′ =*dom numOfLayover*′

= *dom routePrice*′= *dom onBoard*′ = *dom aircraftId*′= *scheduleId*′)

**Complete Schema**

CompleteCheckedAircraftUsed ≙ (CheckedAircraftUsed ∧ Success) ∨ CheckedAircraftUsedError

*CompleteAircraftCheckedUsed*

*scheduleId*, *scheduleId*′: ℙ *SCHEDULEID*

*departDestination*, *departDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*arrivalDestination*, *arrivalDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*departTime*, *departTime*′: *SCHEDULEID* ⇸ *TIME*

*arrivalTime*, *arrivalTime*′: *SCHEDULEID* ⇸ *TIME*

*scheduleDate*, *scheduleDate*′: *SCHEDULEID* ⇸ *DATE*

*scheduleStatus*, *scheduleStatus*′: *SCHEDULEID*⇸ *SCHEDULESTATUS*

*frequency*, *frequency*′: *SCHEDULEID* ⤀ *FREQUENCY*

*daySchedule*, *daySchedule*′: *SCHEDULEID* ⇸ *DAYSCHEDULE*

*numOfLayover*, *numOfLayover*′: *SCHEDULEID* ⇸ℕ

*routePrice*:, *routePrice*′ *SCHEDULEID* ⇸ℕ

*onBoard*:, *onBoard*′ *SCHEDULEID* ↣ℕ

*aircraftId*, *aircraftId*′: *SCHEDULEID* ⤔ *AIRCRAFTID*

*accountId*?: *ACCOUNTID*

*startDate*?: *DATE*

*endDate*?: *DATE*

*deDestination*?: *DESTINATION*

*arriDestination*?: *DESTINATION*

*aircraftUsed*!: (*AIRCRAFTID* × *DESTINATION* × *DESTINATION* ×ℕ)

*totalUsed*!:ℕ

*rep*!: *MESSAGE*

(*role*(*accountId*?) = *staff* ∧ *startDate*? <*endDate*? ∧

(*aircraftUsed* != { *n*: *scheduleId* | (*scheduleDate*(*n*) ≥ *startDate*? ∧ *scheduleDate*(*n*) ≤ *endDate*?) ∧

(*departDestination*(*n*)=*deDestination*? ∧ arrival*Destination*(*n*)=*arriDestination*?)

⦁*a*=*aircraftId*(*n*) ∧*depart*=*departDestination*(*n*) ∧ *arrival*=*arrivalDestination*(*n*)∧

*totalUsed*=#*ran*({*n*}◁*aircraftId*)})

∨

(((*role*(*accountId*?) ≠ *staff* ∧ *rep*!= *roleIncorrect*)

∨

(*startDate*? > *endDate*? ∧ *rep*!= *incorrectDateFormat*))

∧

∧

(*scheduleId*′= *scheduleId* ∧

*departDestination* ′=  *departDestination* ∧

*arrivalDestination* ′= *arrivalDestination* ∧

*departTime*′= *departTime* ∧

*arrivalTime*′= *arrivalTime* ∧

*scheduleDate*′= *scheduleDate* ∧

*scheduleStatus*′= *scheduleStatus* ∧

*frequency*′= *frequency* ∧

*daySchedule*′= *daySchedule* ∧

*numOfLayover*′= *numOfLayover* ∧

*routePrice*′= *routePrice* ∧

*onBoard*′= *onBoard* ∧

*aircraftId*′= *aircraftId*))

∧

(*departDestination*≠ *arrivalDestination* ∧ *routePrice* > *minPrice* ∧

*departTime* ≠ *arrivalTime* ∧

*dom departDestination* = *dom arrivalDestination* =*dom departTime* =*dom arrivalTime*

= *dom scheduleDate* = *dom frequency* = *dom daySchedule* =*dom numOfLayover*

= *dom routePrice* = *dom onBoard* = *dom aircraftId* = *scheduleId* ^

*dom departDestination*′ = *dom arrivalDestination*′ =*dom departTime*′ =*dom arrivalTime*′

= *dom scheduleDat*′*e* = *dom frequency*′= *dom daySchedule*′ =*dom numOfLayover*′

= *dom routePrice*′= *dom onBoard*′ = *dom aircraftId*′= *scheduleId*′)

**Complete Schema**

CompleteSearchRoutes ≙ (SearchRoutes ∧ Success) ∨ SearchRoutesError

CompleteSearchRoutes

*scheduleId*, *scheduleId*′: ℙ *SCHEDULEID*

*departDestination*, *departDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*arrivalDestination*, *arrivalDestination*′: *SCHEDULEID* ⇸ *DESTINATION*

*departTime*, *departTime*′: *SCHEDULEID* ⇸ *TIME*

*arrivalTime*, *arrivalTime*′: *SCHEDULEID* ⇸ *TIME*

*scheduleDate*, *scheduleDate*′: *SCHEDULEID* ⇸ *DATE*

*scheduleStatus*, *scheduleStatus*′: *SCHEDULEID*⇸ *SCHEDULESTATUS*

*frequency*, *frequency*′: *SCHEDULEID* ⤀ *FREQUENCY*

*daySchedule*, *daySchedule*′: *SCHEDULEID* ⇸ *DAYSCHEDULE*

*numOfLayover*, *numOfLayover*′: *SCHEDULEID* ⇸ℕ

*routePrice*:, *routePrice*′ *SCHEDULEID* ⇸ℕ

*onBoard*:, *onBoard*′ *SCHEDULEID* ↣ℕ

*aircraftId*, *aircraftId*′: *SCHEDULEID* ⤔ *AIRCRAFTID*

*from*?: *DEPARTDESTINATION*

*to*?: *ARRIVALDESTINATION*

*departDate*?: *DATE*

*departingFlight*!: (*SCHEDULEID* × *TIME* × *TIME* ×ℕ×ℕ × *CABINCLASS* × *AIRCRAFTTYPE*)

*rep*!: *MESSAGE*

(*from*?≠ *to*? ∧

*departingFlight*!= *schedule*: *scheduleId*; *depart*: *ran*(*departTime*) ; *arrival*: *ran*(*arrivalTime*) ;

*price*: *ran*(*routePrice*) ; *layover*: *ran*(*numOfLayover*) ; *class*: *ran*(*cabinClass*);

*type*: *ran*(*aircraftType*)| *departDate*?= *scheduleDate*(*schedule*) ∧

*departDestination*(*schedule*) = *from*? ∧ *arrivalDestination*(*schedule*)= *to*? ∧

*depart* = *departTime*(*schedule*) ∧*arrival* = *arrivalTime*(*schedule*)

∧

*price*= *routePrice*(*schedule*)

∧

*layover*= *numOfLayover*(*schedule*)

∧

*class*= *cabinClass*((*ran*({*schedule*} ▷ *aircraftId*))

∧

*type* = *aircraftType*(*ran*({*schedule*} ▷ *aircraftId*) ∧ *rep*!=*Success*)

∨

(((*from*? = *to*? ∧ *rep*!= *sameDestination*))

∧

(*scheduleId*′= *scheduleId* ∧

*departDestination* ′=  *departDestination* ∧

*arrivalDestination* ′= *arrivalDestination* ∧

*departTime*′= *departTime* ∧

*arrivalTime*′= *arrivalTime* ∧

*scheduleDate*′= *scheduleDate* ∧

*scheduleStatus*′= *scheduleStatus* ∧

*frequency*′= *frequency* ∧

*daySchedule*′= *daySchedule* ∧

*numOfLayover*′= *numOfLayover* ∧

*routePrice*′= *routePrice* ∧

*onBoard*′= *onBoard* ∧

*aircraftId*′= *aircraftId*))

∧

(*departDestination*≠ *arrivalDestination* ∧ *routePrice* > *minPrice* ∧

*departTime* ≠ *arrivalTime* ∧

*dom departDestination* = *dom arrivalDestination* =*dom departTime* =*dom arrivalTime*

= *dom scheduleDate* = *dom frequency* = *dom daySchedule* =*dom numOfLayover*

= *dom routePrice* = *dom onBoard* = *dom aircraftId* = *scheduleId* ^

*dom departDestination*′ = *dom arrivalDestination*′ =*dom departTime*′ =*dom arrivalTime*′

= *dom scheduleDat*′*e* = *dom frequency*′= *dom daySchedule*′ =*dom numOfLayover*′

= *dom routePrice*′= *dom onBoard*′ = *dom aircraftId*′= *scheduleId*′)