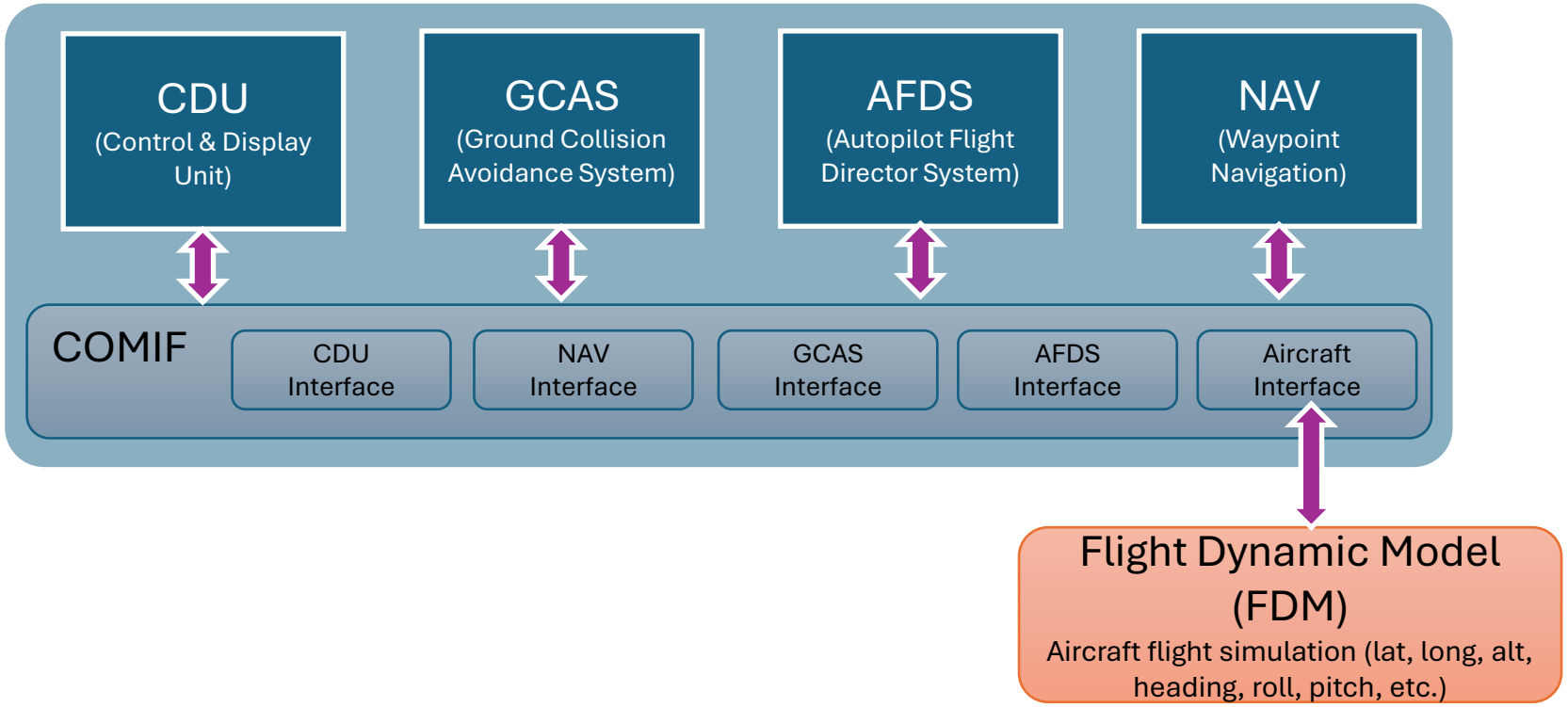
Sample Application



Components

- Each component follows the same pattern
  - A component XYZ is made of two parts:
    - Data interface: XYZ.iface and XYZ.iface.*
    - The implementation: XYZ and XYZ.*
  - The XYZ package contains the single entry point for the component: ‘step’
  - A step is made of 3 actions
    - Read data from the global interface (IF.* packages) to the local interface (XYZ.iface.*)
    - Perform the function(s) of the component
    - Write data back from the local interface (XYZ.iface.*) to the global interface (IF.*)
  - For example, AFDS step subprogram is:

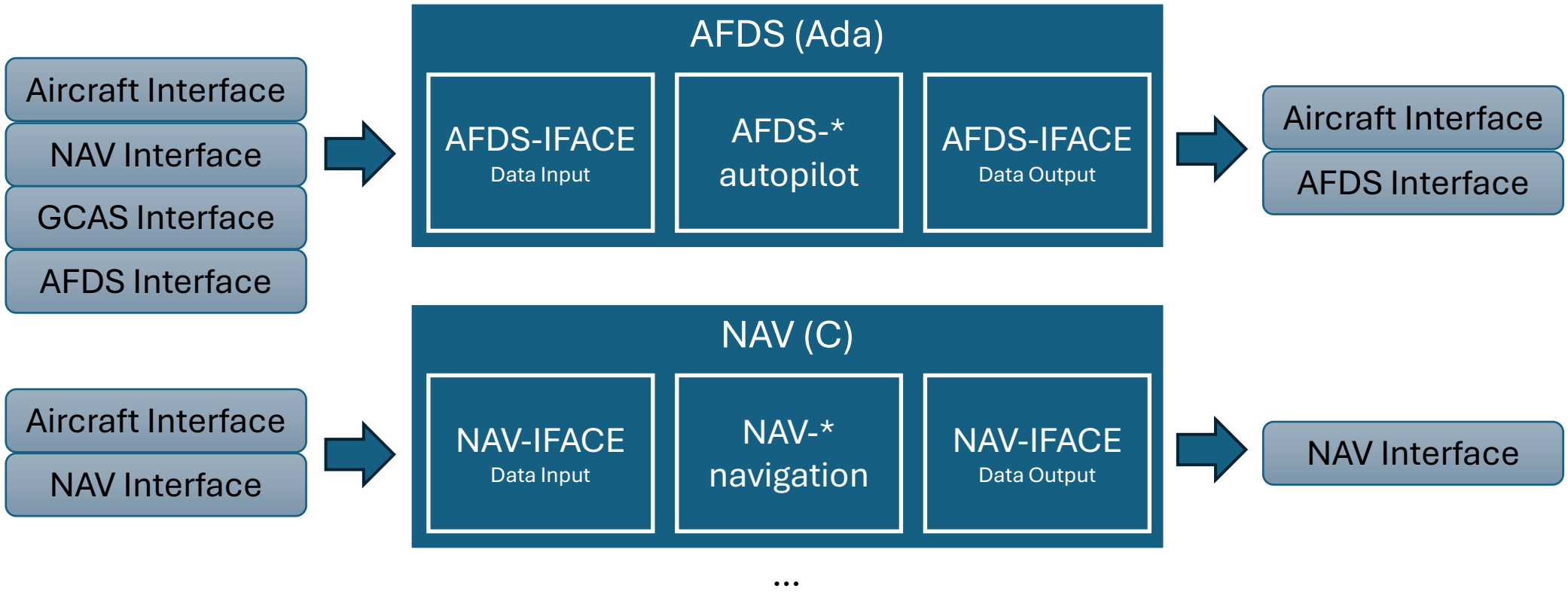
```
procedure step is
   begin
      AFDS.iface.read;    -- read data from all relevant interfaces
      AFDS.GCAS.step;
      AFDS.heading.step;
      AFDS.altitude.step;
      AFDS.velocity.step;
      AFDS.vspeed.step;
      AFDS.roll.step;
      AFDS.pitch.step;
      AFDS.iface.write;   -- write data to all relevant interfaces
   end step;
```

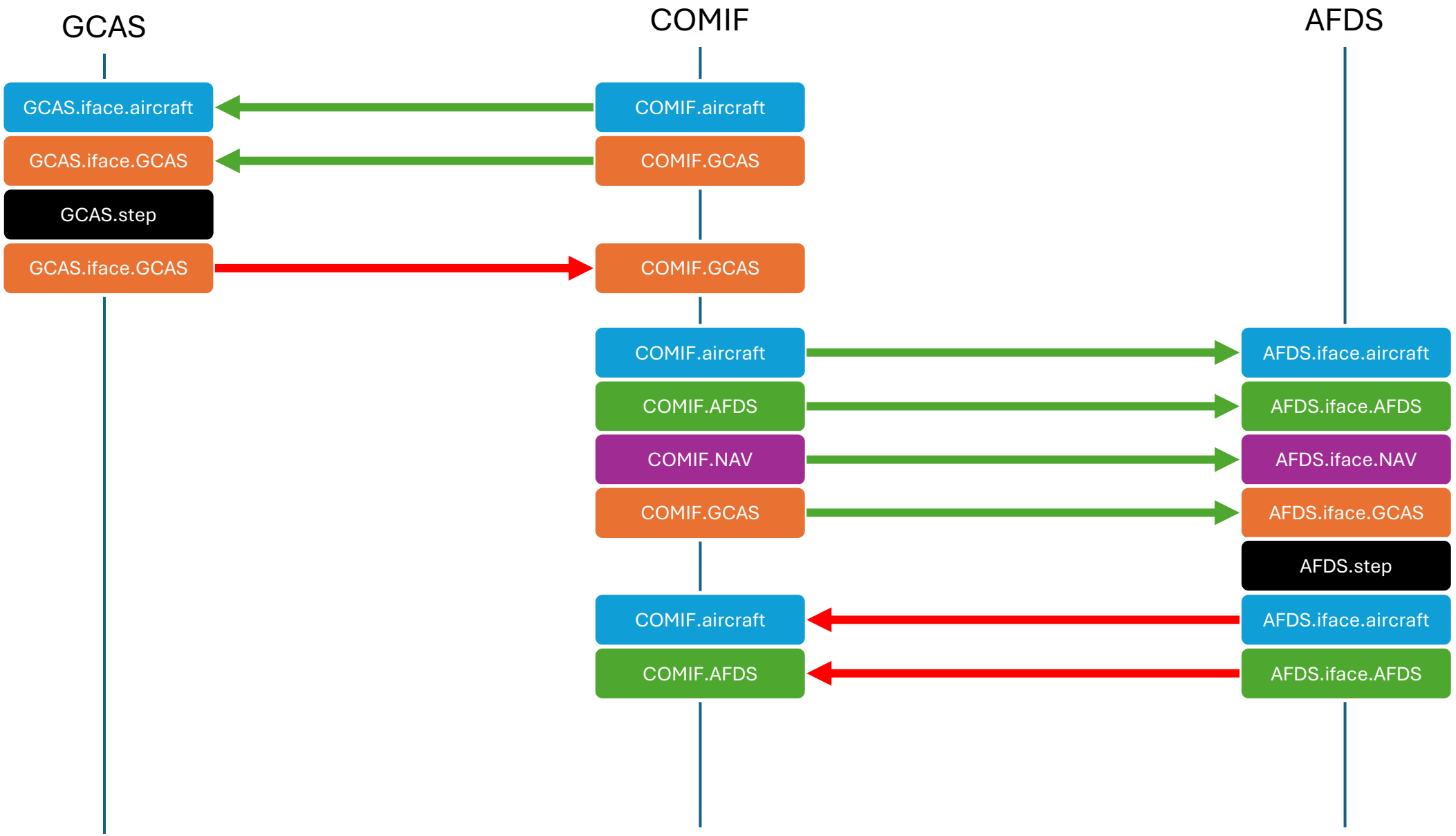
COMIF

Components Interface

Components communication

- Each component read and write data from to the other components via COMIF
  - First, the required component data is read from COMIF in a local copy via the ‘iface’ package (e.g. AFDS.iface)
  - Then, the component function is executed (potentially modifying the local copy of another component data).
  - Finally, the required component data is written back to COMIF




GCAS
COMIF
AFDS
GCAS.iface.aircraft
COMIF.aircraft
GCAS.iface.GCAS
COMIF.GCAS
GCAS.step
GCAS.iface.GCAS
COMIF.GCAS
COMIF.aircraft
AFDS.iface.aircraft
COMIF.AFDS
AFDS.iface.AFDS
COMIF.NAV
AFDS.iface.NAV
COMIF.GCAS
AFDS.iface.GCAS
AFDS.step
COMIF.aircraft
AFDS.iface.aircraft
COMIF.AFDS
AFDS.iface.AFDS

COMIF allowed data paths

	Aircraft status	Aircraft control	AFDS	GCAS	NAV	CDU
AFDS	R	RW	RW	R	R	-
GCAS	R	-	-	RW	-	-
NAV	R	-	-	-	RW	-
CDU	-	-	RW	RW	RW	RW
FDM	RW	RW	-	-	-	-
TEST	RW	RW	RW	RW	RW	RW

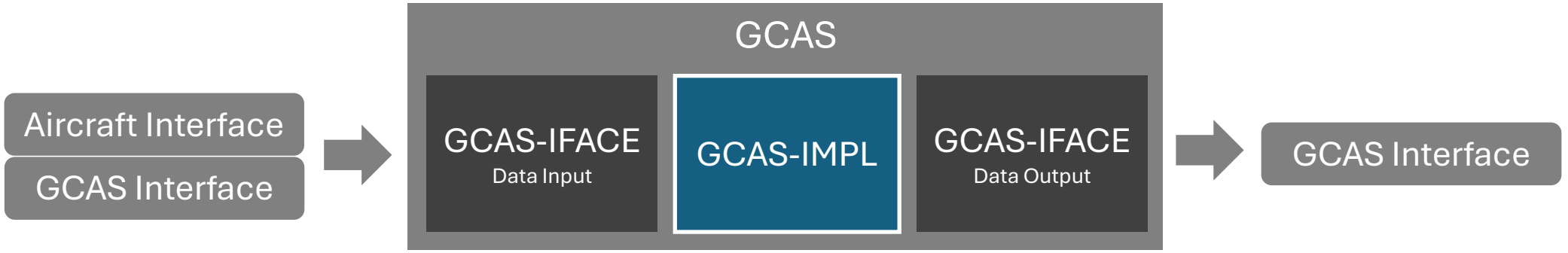
GCAS

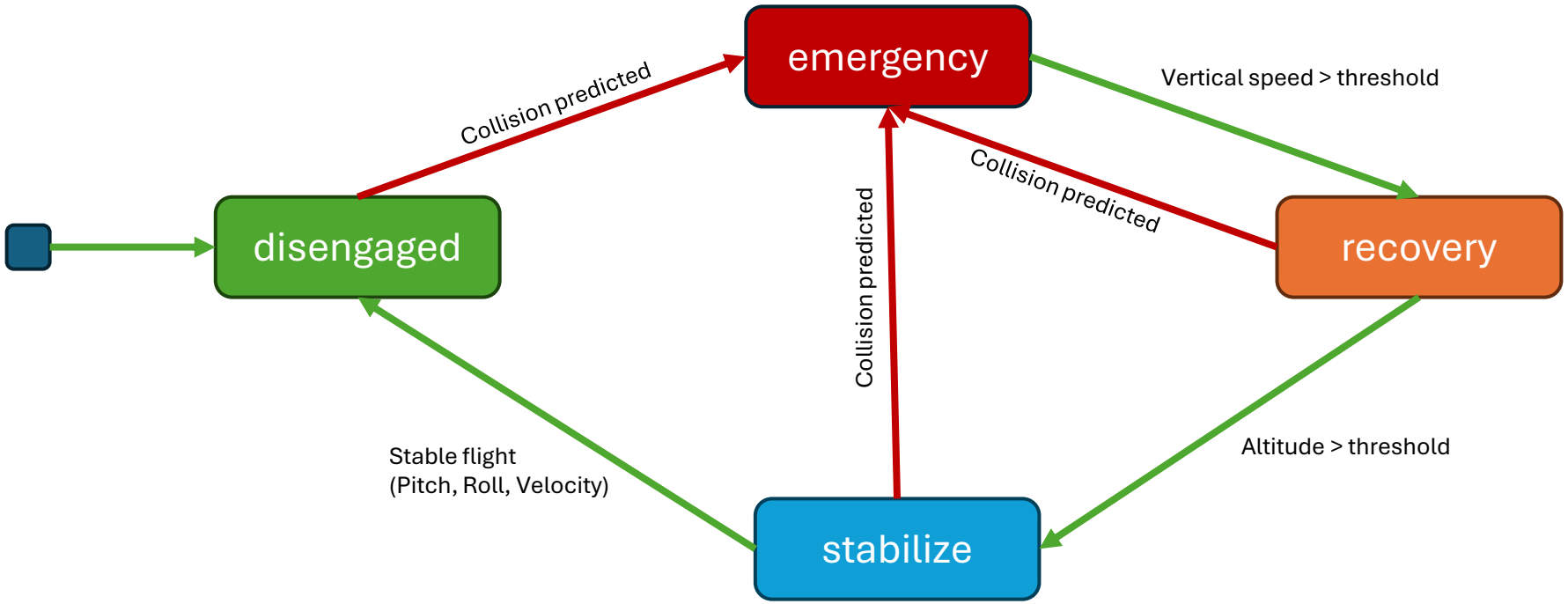
Ground Collision Avoidance System

GCAS

- The GCAS component detect potential ground collision and set the GCAS state accordingly (see next slide)

- The GCAS state is checked by the AFDS component and the AFDS.GCAS function of this component implements the required manoeuvre.


Aircraft Interface
GCAS Interface
GCAS
GCAS-IFACE
Data Input
GCAS-IMPL
GCAS-IFACE
Data Output
GCAS Interface


emergency
Collision predicted
Vertical speed > threshold
disengaged
Collision predicted
Collision predicted
recovery
Stable flight
(Pitch, Roll, Velocity)
Altitude > threshold
stabilize

AFDS

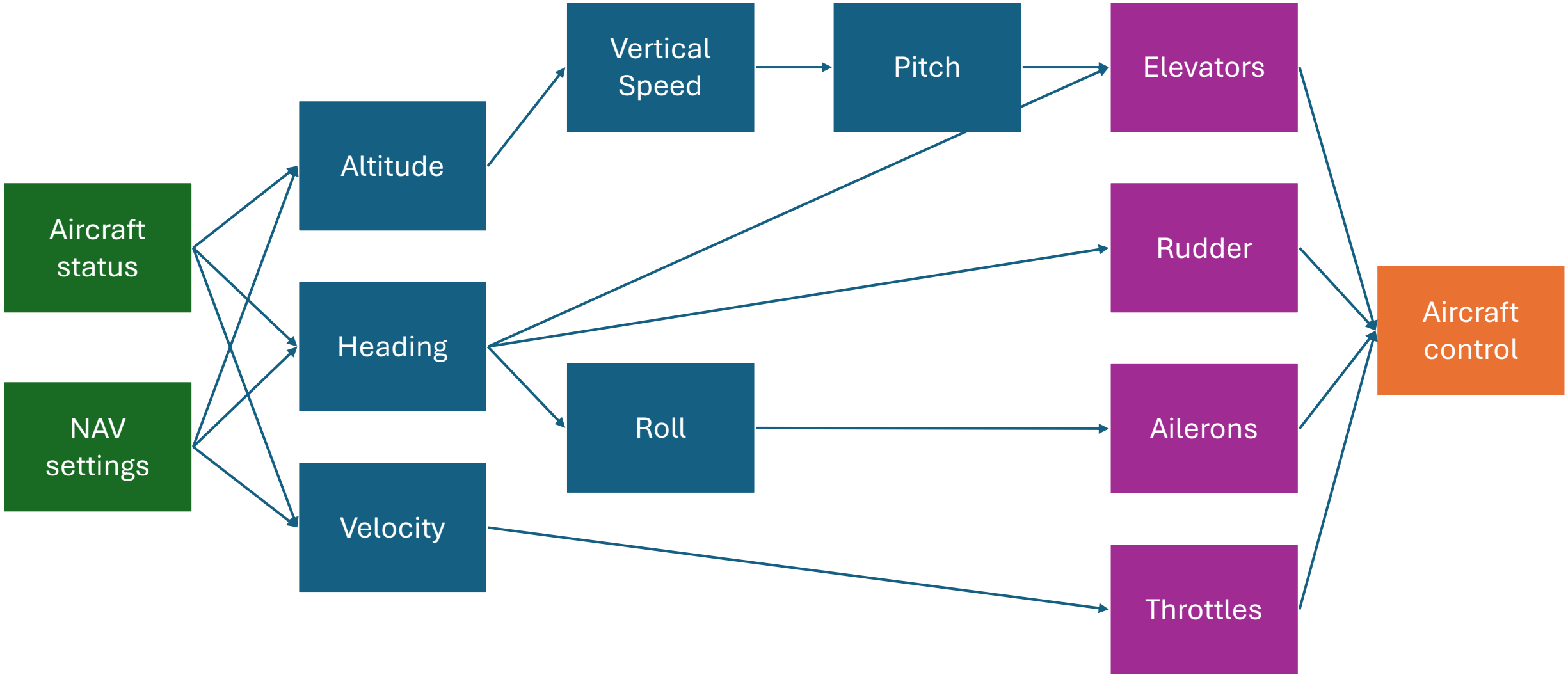
Automatic Flight Director System

AFDS

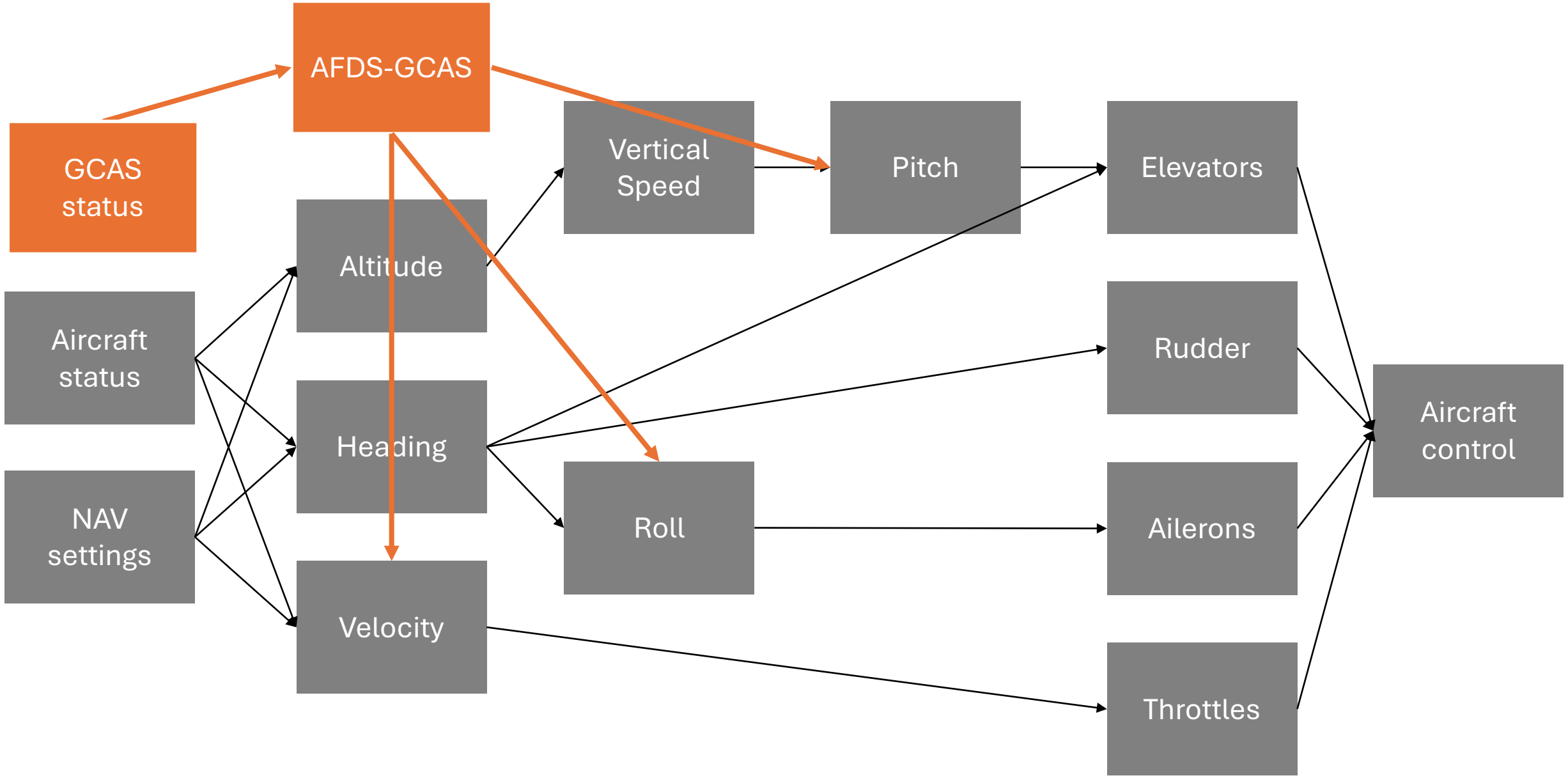
- The AFDS read the current and desired heading, altitude and velocity set by the AFDS, NAV or CDU components and calculate the require commands for the aileron, elevator, rudder and throttle.

- The AFDS.GCAS can override the NAV input to force an emergency collision avoidance manoeuvre.

AFDS-* (Autopilot)



AFDS-GCAS override



NAV

(Waypoint) Navigation

NAV

- This component is implemented in C
- The NAV component navigate to the next waypoint.
- When a waypoint is reached, the next waypoint in the list is selected as the active waypoint.
- Navigation data (desired heading, altitude, velocity) are written to the IFACE.NAV interface for the AFDS component to read.

CDU

Control & Display Unit

CDU

- The CDU component can:
  - Enable/Disable GCAS, AFDS and NAV
  - NAV:
    - Clear the NAV waypoint list
    - Add a waypoint list
  - AFDS
    - Set the desired navigation target

- The CDU component receives
  - The state of GCAS, AFDS and NAV (enabled/disabled)