DAN-HAMIDU LTD.

Elite Aviators

Advanced Flight Techniques Academy

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The following is a blog (presented here in the format of a company profile) representing part of my aspirations for becoming a pilot. The entities described are absolutely fictitious; any resemblance to existing entities as described is absolutely unintended and of pure coincidence.

Contents

History

Elite Aviators – Advanced Flight Techniques Academy (EA-AFTA) is a fictional professional aviation training school which specializes in the training of only professional pilots who already hold PPL, CPL, ATPL licenses. **Elite Aviators** was opened in response to the need for enhanced airmanship skills for the following areas:

Reduction in the number of flights cancelled due to adverse weather.
Developing new skills in using weather radar and a better understanding of the anatomy of adverse weather (meteorological research) means, pilots can pick out and fly through the mildest portions of a storm that would otherwise prompt pilots, airlines and even airport managers to avoid flight operations entirely.

New techniques for enhanced terminal navigation.
Accelerating the extended adoption (worldwide) of techniques which include:

- Continuous Descent Approach (CDA), where safely applicable.
- FIX Trail Approach (FTA).
- Path Object (PO) navigation.
- Area Navigation and Required Navigation Performance (RNAV & RNP).

Enhancing flight performance and safety.

- Exploiting the combination of weather anomalies (fronts, jet-streams, and troughs) and the flight management system to lower the costs of flying (fuel burn, time).
- Alternative Flight Control; using various flight control surface combinations to compensate for sudden loss (or gain) of default flight controls/normal flight; resolving Departure-from-controlled-flight regimes and managing manual flight reversions.

Advancement of flightdeck performance and ergonomics.

- Intuitive Biometric Graphical User Interfaces for secondary and tertiary cockpit systems; touch-screen, Organic Light-Emitting Diode (AMOLED) displays with curved contours.
- Safety redundancies in the form of auxiliary input devices (the cockpit displays that inspired the above-mentioned descendant).
- New windshield/windscreens embedded (as part of laminate) with AMOLED Heads-Up Display system. Fully adjustable, pilots of varying heights can move the multicoloured reticle (graphic interface).
- The introduction of –as standard features, situational awareness enhancers:
    - *Head-mounted Infra-Red (not Low-Light) night vision apparatus.*
    - *Aircraft-mounted, variable geometry (vertical/horizontal tilting) Infra-Red night vision apparatus.*

EA really came to life when a review of NASA's Ames Research on adverse weather flights, inspired a few pilots to make such research routine activities in the classroom. This was followed by a series of unconnected events (pilots involved in non-normal incidents) that would bring these few pilots and a couple more other pilots from different regions across the globe, together to start EA. The incidents include the following (that were shared in web-based forums, the final connecting element that would bring the airmen together to form EA):

Incident 1 – Sudden Blind Approach

A commercial pilot (greatly inspired by certain Hollywood movies) was in the middle of a night-time final approach as the pilot-in-command when a freak power failure at the airport compromised runway landing lights and ILS (basically all electrical power was lost at the time when backup generators were being overhauled). With insufficient fuel for a missed approach/Go-around, this left the pilot in a situation so precarious that nothing ATC said would make any reassuring difference; the movie-driven pilot simply smiled at his F.O. (who was half-terrified) and donned a slightly bulky head-mounted, Infra-Red Night Vision goggle. This pilot feels so much like a hot-shot that he's even had the goggles running secretly since they passed their Top-of-Descent point to avoid the waiting period required for the goggles to initiate into full operation.

Only two full seconds transpire from the moment the lights go out to the moment he grabs and dons the goggles, allowing him to see the runway lights which are still hot (from being on for so long) even though they've lost power. The runway appears clearly and the landing is completed successfully without a declared missed approach/Go-around.

Incident 2 – Weather-Proof Approach

Another pilot (inspired by meteorology) on final approach detects windshear in the form of a sudden microburst, a full second before his aircraft was able to warn him of the danger. The pilot employs a bizarre "surfing" technique to safely evade the microburst. The pilot was able to perceive the adverse condition due to heightened senses he had been honing for months. Already aware of the potential for such windshear on that day, the pilot-in-command set himself into a hyper-sensitive state of alertness:

- He's undergone a bizarre training which has honed the sensitivity of his auditory apparatus, making him sensitive to:
  - Changes in acceleration/deceleration.
  - Changes in air pressure and consequently, significant changes in altitude and vertical speeds.
  - Changes in attitude and direction.

This guy has literally tuned his senses into a built-in barometer and accelerometer.

A microburst develops less than mile ahead of him and he easily feels the rebounding bow of the downdraft as it nudges the nose of his airplane into a sneaky, subtle, un-commanded pitch-up of nearly two degrees. To him, an aircraft pitching-up in the absence of a pilot's command for such means either a weather anomaly (wind up-draft) or a sudden shift (backwards) in the aircraft's centre-of-gravity due to unfastened luggage/cargo, passengers, or even an exaggerated sloshing of fuel in the tanks. In this case, his aircraft has for some time settled comfortably into the normal approach trim…leaving only the anticipated windshear as the culprit.

Not only does the bow of the down-drafting microburst nudge his nose up, but it also shifts it to the right by half a degree in heading. This means he is a little bit to the right of the downdraft and in a split second his left wing will clip some of the bow of the microburst…forcing a slight roll to the right.

His cautionary solution: *the instant his nose was nudged up by something other than his own command, he applied TOGA power setting and used the onset of the slight roll to the right to obtain an accelerated roll twenty degrees to the right while holding on to the higher pitch his nose has taken;* **he needs to build up not extra speed but extra "energy" to evade the core of the continuing downdraft before it drags him down to the ground.** The interesting result is that he has guided the aircraft along a quarter of the downdraft's bow (which is rising up after splashing on the ground); an effect akin to surfing a huge wave at the beach. The bow gives him a "cross-tailing wind, further helping him distance his aircraft from the menacing core of the microburst. In all, he gained two hundred feet of altitude and sixteen extra knots of ground speed (his airspeed increase was too insignificant).

He initiated the evasive manoeuvre a full half-second before his aircraft's windshear warning was triggered off by the developing adverse condition outside! ATC vectors him around for another approach which ends up in a safe arrival, while other aircraft in the area benefit from the generated awareness of the deadly windshear conditions. Safety delivered at the "*Speed of Thought*".

Incident 3 – Radar-guided Storm Surfing

A flight crew is caught up in a freak storm (that evolved too quickly for the forecasters to track). The Captain, a former meteorologist, hands over controls/command of the aircraft to his first officer and instructs him to fly-by-my-command (telling the F.O. which way to go/what to do, etc.). The Captain uses the "tilt" feature of their on-board weather radar (WXR), constantly scanning up and down; his method being to CAT-scan around them and come up with a dynamic vertical profile of the weather challenging their flight…a task too strenuous to be performed while flying the aircraft at the same time.

Fortunately they are flying a large airliner with an excess of fuel generated by friendly weather throughout most of their trip. This allows the Captain to visually plot a criss-cross, topsy-turvy, roller-coaster route throughout the troubled descent phase that was plagued with unreliable aid from ATC. They actually advised ATC that they had an independent approach solution and would require only a clear-out of the traffic pattern. The Captain was able to navigate his F.O. through the mildest portions of the storm based on weather radar returns, and they made a safe albeit long rollout landing.

Incident 4 – Approach by Remote Vision

On a low-visibility daytime flight (deteriorating conditions), a GA flight crew experiences a freak electrical fault that disables several cockpit displays including:

- Primary Flight Displays.
- Navigation Displays (Horizontal/Vertical Situation Indicators).
- Engine Indicators (EICAS for Boeing; ECAM for Airbus).
- Control Display Units (Flight Management Computer interface).
- Mode Control Panel (Autopilot panel).

To further compound matters, they are flying over a private (GA) airfield with limited human activity. The low-visibility comes in the form of dense fog; a total "white-out" situation which leaves the crew disoriented and on the brink of a departure-from-controlled-flight, should they disengage their autopilot (MCP-powered). They radio for help and the owner (also an avionics technician) of a GA aircraft -a Gulfstream G550- undergoing an avionics upgrade by a vendor, responds to the distress call. The Gulfstream owner and vendor (a technician) scramble the jet out of the hangar to execute a rescue-escort flight. The plan is halfway botched due to a fuel shortage; the Gulfstream is yet to be refuelled by a refuelling truck that is yet to return to the airfield.

The owner and vendor (cleaning up the hangar after installing an optional avionic component), decide to use the limited fuel to taxi around the apron while using the radar, its TCAS and its tilt function to find the stricken aircraft above. Using numerous turns, high-speed taxiing, and stops, the aircraft (vendor and aircraft owner) on the ground are able to spot and guide the aircraft above. Fortunately, the transponder of the aircraft above was not affected by the electrical fault. This gave the team below information on the speed, altitude, and direction of the team above, to help guide them in for a safe, blind landing.

EA Vision

Achieve its goals through its firm belief in the doctrine of improvement at every stage. The people at EA are deeply committed to instructing, learning and improvising while dealing with specific needs for divergent applications as the occasion demands. EA has forged a strong partnership with several of the worlds major aircraft manufacturers and avionics manufacturers in a bid to keep the aviation sector enriched with the newest technologies that will make flying safer, more cost effective and technically simplified (albeit the unavoidable complexities).

EA Mission

EA has dedicated itself to the training and development of outstanding professionals who are well equipped, to provide aircraft operators with competent piloting skills, to meet the ever growing challenges of the air travel sector.

EA Advantage

- The only flight training institute in the world to offer advanced flight training techniques (new certifications for each exisiting pilot's licence will be adopted globally: APPL, ACPL, AATPL; to run parallel with existing licenses):
- Pioneers in the extensive use and adaptation of supplemental piloting systems (i.e. night-vision, thermal-vision goggles, etc) as standard flight deck tools.
- Research & Development division for breeding new concepts in aircraft design, airmanship, safety and cost-effectiveness for aircraft operations. EA has an excellent in house R&D team to help meet the industry requirement to develop technical know-how courseware, teaching aids, instructional and evaluation processes. EA follows international aviation standards to ensure imparting high standards of education while also developing newer and better standards for international aviation to adopt.

EA Technological Verticals

In summary, EA embodies the following (with a detailed breakdown following):

- Basic flight training school.
  - PPL.
  - CPL.
  - ATPL.
  - Aircraft type-rating.
- Advanced flight training school.
  - Airmanship development (piloting skills and techniques).
  - Adverse weather operations.
  - Mishap management.
- Research & Development.
  - Flight deck development.
  - Navigation development.
- Air charter services.
- Air Traffic Control training school.

Divisions at EA

The Team

The team of flight instructors is made up of the following, known by their call-sign:

- Leader Man (CEO, Admin, Academics).
- Captain Man (COO, Admin, Academics)
- Flight Man (CTO, Admin, Academics).
- Safety Man a.k.a. *"Mishap Maestro"* (Academics).
- Performance Man (Academics).
- Weather Man (CRO, Meteorology, Academics).
- Engineer Man (R&D, Academics).
- Mechanic Man (Maintenance, Academics).
- Dispatch Man (Operations, Academics).
- Navigation Man (Academics).
- Legal Man (CLO, Admin, FAR, Academics).
- Money Man (CFO, Academics).
- Research Man (R&D, Academics).
- Counsel Man (Counselling, Academics).
- Avionic Man (R&D, Academics).
- Electric Man (R&D, Academics).
- Traffic Man (Air Traffic Control, Academics).
- Ground Man (Ground Crew, Academics).

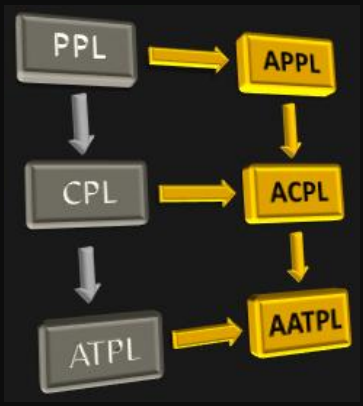
Division: "First Flight" (a.k.a. Basic Flight Techniques Academy)

On popular demand by the public, a basic flying school was opened for new-comers to flying who want to later become the kind of experts that EA produces. Licences obtainable after training include the usual Private Pilot's License (PPL), Commercial Pilot's Licence (CPL), and Airline Transport Pilot's Licence (ATPL). In addition to these, there is a **Type Rating course** for CPL and ATPL holders who wish to specialise on an aircraft of their choice, for their flying career.

Division: "Further Flight" (a.k.a. Advanced Flight Techniques Academy)

This is the core business of EA; turning ordinary pilots into extraordinary pilots. Running parallel to the basic licences are their advanced counterparts. These licence supplements have just been approved and adopted by the FAA and its international counterparts.

- PPL → **APPL** (Advanced Private Pilot's Licence).
- CPL → **ACPL** (Advanced Commercial Pilot's Licence).
- ATPL → **A^{2}TPL** (Advanced Airline Transport Pilot's Licence).



Among many other specialties in this division are the standardized practices of using Low-Light as well as Thermal-Vision apparatus' in poor visibility/adverse weather. Pilots also learn how to maintain stability on the slippery ground, use alternative control surfaces to resolve departure-from-controlled-flight situations.

Special Division: "Traffic Taming"

The standard techniques of air and ground traffic control are taught to students after the development of their flair in managing air and ground traffic. They are exposed to the intricacies of handling traffic in the many areas, some of which include:

- Standard Instrument Departures (SID).
- Standard Terminal Arrival Routes (STAR).
- Radar display interpretation.
- Doppler radar and weather radar (WXR).
- Airport surface layout; runways, taxiways, and parking areas, etc.
- Airport surface lighting layouts; runway lights, taxiway lights, etc.
- Traffic Collision Avoidance System (TCAS) versions and application; Traffic Advisory/Traffic Resolution (TA/RA) management.
- Vertical and Horizontal Separation Minima.
- Ground Traffic management of aircraft and airport service vehicles/ground crew.
- Communications facilities; VHF, HF, UHF, VLF, SatCom, etc.
- Terminal Control, Area Control, etc.
- Airspace classification (Class A, B, C, D, etc.).

Special Division: "Mishap Management"

A special division has been developed for the purpose of "inventing" any imaginable cause of non-normal flight conditions; in other words, the various combination of factors that lead to accidents in the various areas of operation (air, sea, and ground). The **Mishap Managers** take turns in special sessions known as **Mishap Manufacturing**.

Basically, **Mishap Manufacturing** is where aviation accidents are imagined for solutions to be developed. Every two months, students are to "compose" a scripted scenario of something unusual occurring that leads to a mishap. The scenario features elements which lead to a non-normal situation, the consequences, and obviating circumstances; using the following factors:

- Human influence:
  - Maintenance operations and resources (mechanics).
  - Manufacturing operations and resources (technicians, engineers, designers).
  - User operations and resources (flight crew, cabin crew, passengers).
    - Limitations of human physiology.
    - Situational awareness.
  - Service operations and resources (ground crew, air traffic controllers).
- Mechanical influence:
  - Structural failure (fatigue, flawed design, flawed fitting).
  - Electrical defects (wiring, anomalous power flux).
  - Electronic defects (circuitry defects).
  - Fluid disturbances (fire, fluid loss and defects, pneumatic anomalies).
- Environmental influence:
  - Adverse weather (windshear).

Below is a sample script from a student undergoing training at Mishap Manufacturing; his chosen scenario is as follows:

Scenario (based on a past incident):

Structural failure along front upper fuselage, resulting from long term fatigue caused by frequent, cycles of pressurization-depressurization of cabin on Boeing 737-400. Aircraft is used on popular, short shuttle route several times a day.

Event Sequence:

1. Decompression due to weakened section in upper fuselage, crew sucked outside, but miraculously able to hold on to parts of damaged section.

2. Subtle departure from controlled flight, pronounced by nose-up pitch with gradual loss of airspeed. Stall ensues and autopilot, "auto-disconnects"; aircraft enters a slow, reverse tail dive (diving down tail-first). Engine compressor stall results from disrupted airflow at N1 section.

3. Passenger intervenes at same moment and restores controlled flight by pulling yoke back fully so that tail section is forced up by airflow ramming underside of raised elevators. Nose is thus forced down and nose-first dive is restored by passenger, who then quickly switches from yoke-pulled-back to yoke-pushed-forward. Airspeed and control are restored as a result.

4. Restoration of controlled flight (mentioned above) comes too late to arrest developing dual compressor stall (both engines) and associated flame-outs on both CFM56-7 turbofan engines.

5. Unpowered, rapid descent (spoiler aided) to FL100 with APU start made to attempt engine restart. Passenger starts APU with intent of using it to supply bleed air, he is not familiar with windmill-start details.

6. At FL100, a no-bleed engine restart using APU is made (it's a hot day with 35'C at ground level), this yields a higher output potential for engines since they won't be supplying bleed air to air packs. Descent continued to 5,000ft.

7. Resulting retrim en-route and late deceleration (spoiler-aided) from 300kt to 245kt causes sudden change in airflow to shear off a small part of damaged fuselage section, which accidentally gets ingested by engine-2, resulting in damage.

8. Engine-2 is shutdown by passenger to avert further damage (disintegration). Passenger then increases power on left engine to maintain speed while applying left rudder to counter yaw to the right caused by asymmetric thrust (1-engine operation).

9. On ascertaining the correct amount of left rudder input, passenger replaces inputs with appropriate rudder trim (using rudder trim knob at rear of pedestal).

10. Passenger is able to secure controlled flight (on one engine) and further reduces his workload by setting heading, speed and altitude on MCP in order to assess navigational status of the trip via FMS (CDU for input, ND/HSI for output). Original flightplan is called up; current position is ascertained. Fuel is observed to be enough for remainder of flight (all the way through 3000ft) to destination such that little will remain up to arrival.

11. High-speed (250kts IAS) manual approach is made with flaps-15 and concluded with a landing and exit of the runway. Parking follows, under guidance of ground crew and passenger hands over command after shutting down remaining engine while APU continues to run. Emergency is downgraded to allow normal disembarking of aircraft by all passengers. Flight crew are both found and rescued from top of aircraft where they have been (miraculously) hanging-on throughout the whole incident.

Special Division: "AeroScience" Aircraft Design & Development

It has discovered that the flair for flying at EA, a few of the pilots (students and instructors alike) possess other remarkable talents and alternate qualifications; some of which are aviation-related and some that are not. Some of the irresistible, aviation-related talents and alternate qualifications that were discovered included that of fine arts, industrial design, mechanical and aeronautical engineering. EA was quick to capitalize on this discovery by setting up yet another special division that would capture and promote the honing of such talents to its advantage. Enter the special division of AeroScience; the division that spawned production aircraft concepts that could not be ignored. This division would eventually become a full-fledged subsidiary in the form of an aircraft manufacturer, to compete with other globally known aircraft manufacturers. Below are some of the pioneering excerpts of projects at AeroScience:

Project 1: AeroScience AS-360 Peacock

Type:
General Aviation (executive/corporate/cargo) transport. 4-crew, 8-12 passengers.

Fuselage:
Laterally widened, tear-drop shaped cross-section with blended, semi-flattened under-side (belly) and lower wing root fairings; a.k.a. "Lifting body".

Powerplant:

Turboprop Option-1:

Two 5,000shp free turbine turboprops, each with a 5-composite curved bladed, propellers.
Ex. Pratt & Whitney PT6B.

Turboprop Option-2:

Two 5,000shp free turbine turboprops, each with a tandem pair of 5-composite curved bladed, contra-rotating propellers.
Ex. Pratt & Whitney PT6B.

Electroprop Option-3:

Two APU-powered, 5,000shp **turbo-electric propeller** engines, each with a 5-composite curved bladed, propellers.

Performance Profile:

- Use less fuel at higher speeds of rivals due to lifting-body design of fuselage, while flying higher and further.
- FADEC-powered autothrottle with autotrimming of propeller speed and condition lever.
- 3,000 ft/min max. Rate-of-climb.

Operating Speeds:

Long range:	Mach 0.76 @ FL400
Normal speed/range:	Mach 0.80 @ FL400
High speed:	Mach 0.82 @ FL400

Operating Altitude:

Max:	FL410.
Econ:	FL350 – FL400.

Operating Range:

Turboprop Option:

With 2 flight crew, 2 cabin crew, 8 passengers and baggage:

- Normal range: 5,000nm.
- Long range: 6,000nm.

Electroprop Option:

With 2 flight crew, 2 cabin crew, 8 passengers and baggage:

- Normal range: 10,000nm.
- Long range: 14,000nm.

Wings:

- 35º swept wing with TE fowler flaps and outboard spoilers and blended winglets.
- Manual and automatic (with defeat switch) flaps setting range: UP – 7 – 15 – 25 – 35/FULL.

Flight Control Architecture:

- Dual-redundant Fly-By-Light (FBL), optically linked flight augmentation system.
- Sidestick features Twistick-operated, variable steering, nose gear control.
- Auto-retract/extend landing gear.
- FD-controlled TCAS in VNAV/LNAV:
  TCAS Modes: TA – TA/RA – TA/RA/RE (RE = Resolution Execution; auto-evasive manoeuvring).

Flightdeck Displays:

DESIGN – 1:

- 2-crew, 5-main displays cockpit.
- Helicopter-type layout Flight Instrument Display (FID).
  - *Centre FID features touch-screen; an Active Matrix Organic Light Emitting Diode (AMOLED), curved contour **display** running from top to bottom of centre pedestal.*
    - Display presents GUIs for ECAM/EICAS, twin FMC-CDUs, radio manager
- 4-pane cockpit **windows**.
  - *Front windows run from top to knee-level.*
    - Embedded with AMOLED to present HUD reticle (this does away with HUD combiner…bulky hardware).
- Side FIDs (Captain and FO) are a pair of 2-piece, fold-and-swivel-to-side, touch-screen AMOLEDs with flat contour.
- Each Side FID and the Centre FID has its own dedicated, high capacity Lithium-ion backup battery in case of failure of main power source, with over-charge protection and power level indication.

DESIGN – 2:

- 2-crew, 3-main pschologram displays cockpit.
- Conventional layout Flight Instrument Display (FID).
  - *Lower centre FID features touch-screen; an Active Matrix Organic Light Emitting Diode (AMOLED), curved contour **display** running from middle to front bottom of centre pedestal.*
    - Display presents GUIs for EICAS, twin FMC-CDUs, radio manager
- 4-pane cockpit windows.
  - Forward windows feature embedded HUD reticle (this does away with HUD combiner…bulky hardware).
- Side FIDs (Captain and FO) are each a pschologram projection cavity.
- Upper centre FID is a pschologram projection cavity for EICAS.

Flightdeck Controls:

- **User Input Device (UID)**: This is essentially a mouse unit mounted on inner armrest of each seat, just beside centre pedestal. Resembling the sidestick anatomically, the UID allows the pilots to interact with **Intuitive Control and Display System (ICDS)** of the pscholographically projected image (or reticle) on the 3 main displays. The joystick shaped UID has a tracker-ball mouse control surrounded by a rotating bezel (zooming control) and 3 buttons; display jumping of the mouse cursor. The trigger control in front of the joystick UID serves as the "mouse click button". The placement of this UID on the inner armrest of each seat ensures that the pilot's hand inputs on are never compromised (shaking) even in the worst conditions of turbulence. The armrests themselves are anatomically shaped to prevent arm strain as well.

Project 2: AeroScience AS-440 Flamingo

Type:

General Aviation (executive/corporate) transport. 4-crew, 8-16 passengers.

Fuselage:

Laterally widened, tear-drop shaped cross-section with blended, semi-flattened under-side (belly) and broadened lower wing root extensions; a.k.a. "Lifting body".

Powerplant:

Pair of high-bypass, "supercruise" thrust turbofans:

Turbofan Option-1:

Option 1: Pair of 20,000lbs thrust turbofans.

Turbofan Option-2:

Option 2: Civil version of supercruise-equipped turbofan featured on Boeing F-22 Raptor.

Performance Profile:

- Use less fuel at same speeds as rivals due to lifting-body design of fuselage.
- FADEC-powered autothrottle with autotrimming of propeller speed and condition lever.

Operating Speeds:

Vstall clean:	IAS 110 kts	(with full flaps, gear down).
V_{MC}:	IAS 130 kts	(full flaps, gear down).
V_{APR}:	IAS 120 kts – 150 kts.	
V_R:	IAS 115 kts – 125 kts	(depending on weight, weather).
Low-alt Long range cruise:	Mach 0.950	(≤ FL500) high AoA to be expected.
Hi-alt Long range cruise:	Mach 0.980	(≥ FL550).
Normal cruise:	Mach 1.200	(FL500 – FL600).
Maximum cruise:	Mach 1.250	(FL600 – FL651).
V_{NE}/M_{MO}:	Mach 1.260	(FL610 – FL651).

Operating Altitude:

Normal:	FL500 – FL650.
Maximum:	FL651

Operating Range:

(2 flight crew+4 cabin crew+8 passengers+ baggage):

- Subsonic: 10,000nm.
- Supersonic: 5,250nm.

Wings:

Variable Geometry (swing-wing).
Manual and automatic (with defeat switch) Wings/Flaps setting range:
WNG60 – WNG45 – WNG20
|
FLP.0 – FLP.7 – FLP.15 – FLP.27 – FLP.38

VG-1 Option: (complicated)

No winglets.

- Actuation (electro-hydraulic) options:
  - Piston/strut.
  - Screwjack.
  - Rack-and-pinion.

VG-2 Option: (very complicated)

The blended winglets have passive actuation pivots to keep them facing forward, regardless of variation in wing-sweep angle.

- Actuation (electro-hydraulic) options:
  - Piston/strut.
  - Screwjack.
  - Rack-and-pinion.

VG-3 Option: (outrageously complicated)

- With variable-geometry winglets (variable-blending):
  - Subsonic configuration: 65° rise = "high-for-slow".
  - Transonic configuration: 30° rise = "medium-for-normal".
  - Supersonic configuration: 5° rise = "low for fast".
- Actuation (electro-hydraulic) options:
  - Piston/strut.
  - Screwjack.
  - Rack-and-pinion.

Wing design analysis:

Wing Option-1 has fewest moving parts and allows for greater fuel capacity and is supersonic speeds but has poor ability (if possible) to fly at low and subsonic speeds with nose-level attitude.

Wing Option-2 has more moving parts, less fuel capacity, is transonic and can fly at low and subsonic speeds with nose-level attitude due to TE flaps being extended for extra lift.

Wing Option-3 has the most moving parts (more weight), will probably hold less fuel unless it has a large wing root extension to offer needed fuel tank. Swinged fully forward, it can fly at slow and subsonic speeds with nose-level attitude. Swept halfway back, it allows for subsonic and transonic flight and swept fully back, it allows for supersonic flight.

Wing Option-4 is rather unpractical and will unlikely go beyond conceptual stage unless another unprecedented, quantum-leap in aerodynamics and materials development is encountered at short notice.

Flight Control Architecture:

- Dual-redundant Fly-By-Light (FBL), optically linked flight augmentation system.
- Sidestick features Twistick-operated, variable steering, nose gear control.
- Auto-retract/extend landing gear.
- FD-controlled TCAS: TA – TA/RA – TA/RA/RE (RE = Resolution Execution, auto-evasive action).

Flightdeck Displays:

DESIGN – 1:

- 2-crew, 5-main displays cockpit.
- Helicopter-type layout Flight Instrument Display **(FID)**.
  - *Centre FID features touch-screen; an Active Matrix Organic Light Emitting Diode (AMOLED), curved contour **display** running from top to bottom of centre pedestal.*
    - Display presents GUIs for ECAM/EICAS, twin FMC-CDUs, radio manager
- 6-pane cockpit **windows**.
  - *Front windows run from top to knee-level.*
    - Embedded with AMOLED to present HUD reticle (this does away with HUD combiner…bulky hardware).
- Side FIDs (Captain and FO) are a pair of 2-piece, fold-and-swivel-to-side, touch-screen AMOLEDs with flat contour. An optional concept being examined is to do away with these flat panels, and have the PFD/ND presented as reticles on the lower half of both OLED-equipped forward windows.
- Each Side FID and the Centre FID has its own dedicated, high capacity Lithium-ion backup battery in case of failure of main power source, with over-charge protection and power level indication.
- Sidewall-mounted cursor controls are featured for FID usage in turbulent flight regimes.

DESIGN – 2:

- 2-crew, 3-main pschologram displays cockpit.
- Conventional layout Flight Instrument Display (FID).
  - *Lower centre FID features touch-screen; an Active Matrix Organic Light Emitting Diode (AMOLED), curved contour **display** running from middle to front bottom of centre pedestal.*
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  - Forward windows feature embedded HUD reticle (this does away with HUD combiner…bulky hardware).
- Side FIDs (Captain and FO) are each a pschologram projection cavity.
- Upper centre FID is a pschologram projection cavity for EICAS.

Flightdeck Controls:

- **User Input Device (UID)**: This is essentially a mouse unit mounted on inner armrest of each seat, just beside centre pedestal. Resembling the sidestick anatomically, the UID allows the pilots to interact with **Intuitive Control and Display System (ICDS)** of the pscholographically projected image (or reticle) on the 3 main displays. The joystick shaped UID has a tracker-ball mouse control surrounded by a rotating bezel (zooming control) and 3 buttons; display jumping of the mouse cursor. The trigger control in front of the joystick UID serves as the "mouse click button". The placement of this UID on the inner armrest of each seat ensures that the pilot's hand inputs on are never compromised (shaking) even in the worst conditions of turbulence. The armrests themselves are anatomically shaped to prevent arm strain as well.

Flightdeck Controls:

- **User Input Device (UID)**: This is essentially a mouse unit mounted just beside the side-stick primary flight controller. The UID allows the pilots to interact with **Intuitive Control and Display System (ICDS)** of the aircraft. The mouse also has an anatomically shaped hand mound with the roller ball mouse control place where the index finger's range of movement is expected. Also, there is a scroll thumb-wheel (placed in the movement area of the user's thumb) for zooming in/out of displayed maps; when pressed while rolling, one is able to transfer the mouse cursor from one display to another, in what is called "screen jumping". The placement of this feature together with the side-stick primary flight controller ensures that the pilot's hand inputs on either are never compromised (shaking) even in the worst conditions of turbulence. An anatomically shaped armrest behind them allows the crew to avoid arm strain as well.

The Fleet

The air fleet consists of a combination of privately owned and institution owned aircraft which are dedicated to training of its students. They have been highly customized with optional flight enhancement kits (weather, performance and flight data/audio/video recorder with LiveStream feature, etc):

Heavy fixed wing aircraft

- **Airbus A380**
- **Boeing 747-8iX (Intercontinental Executive)** with re-adaptable combi cabin layout (Biz/Cargo), extra fuel tanks, dual HUD, 40 passenger/2 crew, SVPFD, EVS-III (+ head-mounted unit).
- **Boeing 787-9ERX** (Extended Range Executive); in-production replacement for the Boeing 757.
- **Boeing 777-200ER** carretted nacelles, dual HUD, SVPFD, EVS-III (+ head-mounted unit).
- **Boeing MD-11** carretted nacelles, dual HUD, SVPFD, EVS-III (+ head-mounted unit).
- **Boeing 757-200ERX** (Extended Range Executive); a custom-built, BBJ-version of 757 with carretted nacelles, dual HUD, 45 passenger/2+6 crew and extra fuel tanks, SVPFD, EVS-III. This airplane is desired as a classic, legacy, collector's item.
- **Boeing 737-7 (MAX)** BBJ version of Boeing's smallest, next-gen 737; custom-built with, dual HUD, 20 passenger/2+4 crew and extra fuel tanks, SVPFD, EVS-III (+ head-mounted unit).
- **Boeing 737-9 (MAX)** BBJ version of Boeing's largest, next-gen 737; custom-built with, dual HUD, 35 passenger/2+6 crew and extra fuel tanks, SVPFD, EVS-III (+ head-mounted unit).
- **Boeing 737-700/BBJ (NG)** BBJ version of Boeing's smallest, current 737; custom-built with, dual HUD, 35 passenger/2+6 crew and extra fuel tanks.
- **Boeing 737-900/BBJ-3 (NG)** BBJ version of Boeing's largest, current 737; custom-built with, dual HUD, 35 passenger/2+6 crew and extra fuel tanks, SVPFD, EVS-III (+ head-mounted unit).
- **Airbus A350** dual HUD, BTV, Auto-TCAS, SVPFD, EVS-III (+ head-mounted unit), BTV.
- **Airbus ACJ330-200** corporate/business cabin with blended winglets, extra fuel tanks, dual HUD, BTV, Auto-TCAS, SVPFD, EVS-III (+ head-mounted unit), BTV.
- **Airbus ACJ320** with blended winglets, extra fuel tanks, dual HUD, BTV, Auto-TCAS, SVPFD, EVS-III (+ head-mounted unit), BTV.
- **Lockheed L-100/C-130J Hercules**

Medium fixed wing aircraft

- **Gulfstream G650** with PlaneView, PlaneBook, SVPFD, EVS-III (+ head-mounted unit).
- **Gulfstream G550** with PlaneView, PlaneBook, SVPFD, EVS-III (+ head-mounted unit).
- **Bombardier Global 9000**
- **Bombardier Global 7000**
- **Cessna Citation Ten**
- **Learjet 85**
- **Learjet 60XR**
- **Learjet 45**

Light fixed wing aircraft

- **Beechcraft KingAir-350** with Garmin GPS1000 glass cockpit.
- **Q400**
- **Pilatus PC-21**
- **Pilatus PC-12**
- **Cessna C208B Grand Caravan** with Garmin GPS1000 glass cockpit.
- **Cessna C675 Caravan** amphibian with Garmin GPS1000 glass cockpit.
- **Cessna C206 Stationair Turbo** with Garmin GPS1000 glass cockpit.
- **Beechcraft B58 Baron** with Garmin GPS1000 glass cockpit.
- **Cessna C172SP Skyhawk** with Garmin GPS1000 glass cockpit.
- **Cessna C182RG Skylane** with Garmin GPS1000 glass cockpit.
- **Cessna C172-R Skyhawk** with Garmin GPS1000 glass cockpit.

Rotary wing aircraft

- **Sikorsky CH-53E Super Stallion**
- **European Helicopters EH-101 Merlin**
- **Augusta A109**
- **Bell 206B Jetranger III**
- **Eurocopter EC135**
- **Boeing MD500E Defender**
- **Robinson R22Beta**
- **Aerospatiale AS365 Dauphin-II**.

The Training

The Elite Aviators – Advanced Flight Techniques Academy (EA-AFTA) starts where other aviation training schools stop; its airmanship taken a step further, from the conventional to the unconventional realms of flying. **Elite Aviators** (EA) are driven to make those seemingly impossible aspects of civil flying second-nature and as routine as flying itself.

Global Presence

Training hubs are in the works to provide the following:

- Maximise proximity to the most diverse weather and terrain available, for enhanced trainee skills acquisition.
- Ease-of-access for foreign trainees.
- Job-creation for locals, either as staff of EA or manpower for EA-associated projects (taxiway and tarmac/apron expansion).

EA and the Present

Unrelenting adherence to our commitments since inception forms the heartbeat of EA.

- **Draw on the expertise of seasoned trainers.** Our trainers are seasoned professional pilots holding Instructor, ATPL and CPL licenses. Together, they have accumulated thousands of flying and teaching hours and have written numerous books. No other training centre in the world has a team with this level of expertise.
- **Provide an environment that is conducive to learning (and training).** Inter alia an optimized trainer-to-trainee ratio; trainees have access to top-of-the-line Infrastructure (simulators, workshops, labs, ICT-powered campuses and residential area, etc). Our goal is to make your learning experience as enjoyable and beneficial as possible. This is why we adhere to rigorous standards and methodology to ensure quality training delivery.
- **Provide comprehensive learning material.** EA provide each participant with comprehensive material (printed, online, CBT) that serves as an easy-to-use reference guide in which students can find all the information covered during the course. Because of our research, we also produce new content for the rest of the aviation sector to evaluate and adopt, thereby helping to set new international standards or simply enhancing existing standards.
- **Offer an unparalleled price/quality ratio.** We are committed to offering high-calibre training at a price/quality ratio unrivalled in the world.
- **Provide concrete and current course content.** We constantly update and improve our courses in response to the suggestions and criticism provided by our students and aviation regulatory bodies in the evaluation forms they fill out and also by taking regular inputs from our partners and clients in the industry. Our course content is concrete, and it is delivered with a focus on logical progression and over-all comprehension.

EA and the Future

- Trigger-off airport/airfield enhancement projects as part of dividends for the locals who host planned campus expansions by EA.
- Campus (training hubs) expansion to major regions of the world.
- To become the world's most preferred flight training and research organization.
- Work closely with major aircraft and avionics manufacturers to ensure quality products and services for the industry.

Cross-section of EA Clients and Partner Base

Design by:

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