

FLY-BY-WIRE SUMMIT II

MARCH 3RD-4TH 2020



Fly-by-Wire Summit II: Automation Integration for
Simplified Handling Qualities (SHQ)

[VIEW DETAILS](#)



MARCH 3RD & 4TH 2020 | HARD ROCK HOTEL - DAYTONA BEACH, FLORIDA, USA

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USE GROUP CODE FLIGHT030320 OR CALL THE RESERVATIONS DEPARTMENT AT
386-947-7352 AND ASK FOR THE FLIGHT LEVEL ENGINEERING SPECIAL RATE.



Fly-by-Wire Summit II: Automation Integration for Simplified Handling Qualities (SHQ)

GOAL:

Discuss research, development, and philosophy to achieve SHQ that results in a new training/safety paradigm

OBJECTIVE:

- 1) Share progress and activity among all researchers
- 2) Collaborate (Govt, Industry, and Academia) and propose research that will directly support the development of means of compliance for aircraft certification, operational requirements and pilot licensing.
- 3) Discuss advanced automation and VTOL concepts that include distributed propulsion and integral control
 - Unified like flight control system concepts*
 - EZ-FLY like flight control system concepts*

Tuesday 3 MARCH (Day 1)

Time: 08:30 – 17:00

Location: Hard Rock Hotel Conference Room

0830-0900 Welcome/ Overview / Administrative (Borja Martos, FLE)

0900-0930 KAHOOT! Quiz (Borja Martos, FLE)

0930-1000 Problem Statement, Precompetitive Research and Development (Bruce Holmes, Consultant)

1000-1030 Problem Statement, Purpose and End Goal, Summit Outcomes (Wes Ryan, FAA)

1030-1100 Networking Break

1100-1200 FAA Part 23 Research Update (Dave Sizoo, FAA)

1200-1300 Lunch

1300-1400 FAA Rotorcraft Research approach (Dan Dellmyer, FAA)

1400-1500 How does an applicant know before a design is started what Airworthiness Requirements will be applied to the design (ref: CFR Part 21.17) (Peter White, FAA)

1. What design features does an applicant need to include or avoid to get the set of airworthiness requirements the applicant wants (Part 23, vs. Part 27 vs. something else)?
2. Should we combine the appropriate parts of CFR Part 23 (airplane) and CFR Part 27 (rotorcraft) to create a new aircraft certification class (SVO) and airman certification category (SVO)?

1500-1530 GAMA Update (Carl Dietrich / Lowell Foster, GAMA)

1530-1600 Networking Break

1600-1630 NASA Grand Challenge Update (Michael Feary, NASA)

1630-1700 Day 1 Summary and Discussion (Noel Duerksen, Consultant)

19:00-21:00 FLE Hanger Tour (Includes Aircraft Demonstration)

*Unified and EZ-FLY like pilot-in-the-loop simulators will be available for live demonstrations



Wednesday 4 MARCH (Day 2)

Time: 08:30 AM- 17:00 PM

Location: Location: Hard Rock Hotel Conference Room

0830-0900 Introduction to guided discussions with real time audience questions (Noel Duerksen, Consultant)

0900-0950 Guided discussion 1 – SHQ (Simplified Handling Qualities) versus SVO (Michael Feary, NASA)

1000-1050 Guided discussion 2 – Automation growth from advisory – assistive - responsible (Wes Ryan, FAA)

1100-1200 Research Update – NASA SVO pilot study (Noel Duerksen, Consultant)

1200-1300 Lunch

1300-1315 Open microphone introduction – Audience can make statements / ask questions (Borja Martos, FLE)

1315-1400 Open microphone session

1400-1430 Networking Break

1430-1530 GROUP DISCUSSION (Shawn Hayes, FAA)

We currently have airplanes, rotorcraft and powered lift as pilot categories. Do we need other pilot categories?

1530-1630 SUMMARY DISCUSSION – Provisions for future industry and government collaborate research (Ken Goodrich, NASA)

1630-1700 WRAP UP and announcements (Borja Martos, FLE)

NOTE – If you are unable to attend, we are working on various communications options to encourage remote participation. This includes a bridge line and other web-based services. Additional details are forthcoming.

FLIGHT LEVEL ENGINEERING WILL HOST A FREE RAFFLE. THE WINNER WILL RECEIVE A FREE FLIGHT DEMO OF THE EZ-FLY FLIGHT CONTROL SYSTEM. ATTENDEES WILL BE LIMITED TO ONE TICKET PER PERSON. YOU MUST ATTEND IN PERSON TO PARTICIPATE. THE WINNER WILL ALSO GET A SNEACK PEAK AT FLE'S NEW 6-DOF IN-FLIGHT SIMULATOR AIRCRAFT.





So, what are UNIFIED and EZ-FLY concepts?

Both Unified and EZ fly concepts are fly-by-wire flight control systems that are useful in discussing advanced VTOL concepts.

UNIFIED is a fly-by-wire flight control system developed for the VTOL capable F-35B Joint Strike Fighter. (see Figure 1).

Inceptor is a term used to describe how a pilot makes inputs to the fly-by-wire system.

For wing-borne (lifting mode in forward flight), it flies like a military fighter airplane (see blue bars below). For hovering (VTOL lifting mode), the Fly-by-wire controls are mechanized in a new way that is different from helicopter and Harrier controls (see green bars below). In transition (lifting mode between forward flight and VTOL lifting modes), the flight control system blends between forward flight and VTOL as a function of speed (see blue-green transition).

Note that a **UNIFIED like concept** can be applied to civilian VTOL vehicles and is being used in FAA sponsored research to develop airworthiness standards for vehicle certification.

EZ-FLY is a conceptual VTOL Fly-by-wire flight control system. It is a derivative of a concept that has been flight tested in forward flight. The FAA sponsored this research project with Flight Level Engineering utilizing their Fly-by-wire Navion. It has also been flown on a fly-by-wire Bonanza airplane (Noel Duerksen Consulting)

The **EZ-FLY** concept is an example of a system meant to simplify pilot operations (see figure 2). Notice that the bars in EZ-FLY are a solid green color. This means that the pilot is commanding the same thing throughout the aircrafts' speed range. This is an important simplification.

In addition, the EZ fly concept blends the following protections within the flight control system.

EZ-FLY VTOL Protections:

- Angle of Attack
- Bank angle
- Pitch angle
- Airspeed
- G Loading
- Terrain
- Pilot Error
- Pilot Incapacitation
- Settling with power
- Power plant protections (high and low rotor speed)
- Dynamic rollover

THESE DIAGRAMS ARE PRELIMINARY CONCEPTS & ARE NOT CONSIDERED FINAL DEFINITIONS

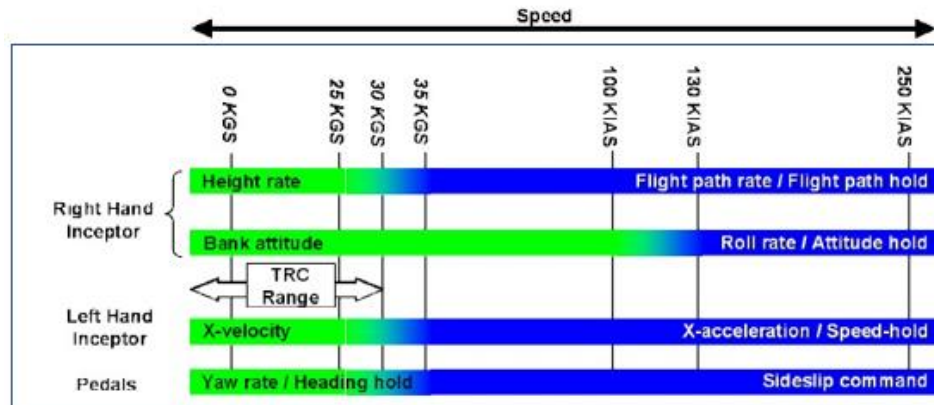


Figure 1- **F-35B Unified** Flight Control System – Image reproduced from “Flight Control Functionality for Advanced STOVL Flight Control,” by Denham, J.W. and Paines, J.D.B. 45th Annual SETP Symposium

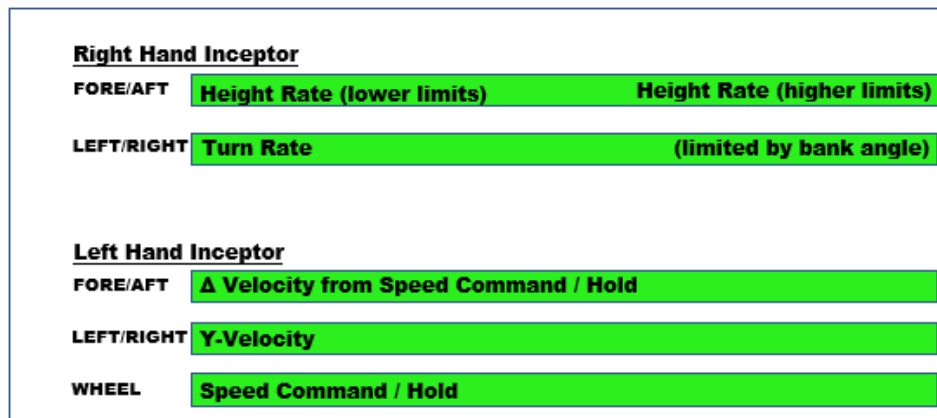
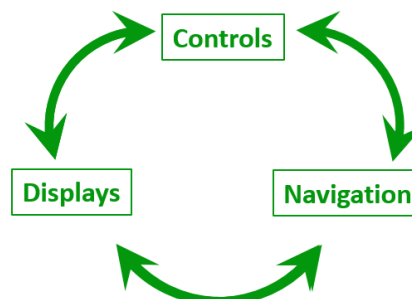


Figure 2 - **EZ-Fly concept** Flight Control System – Copyright Noel Duerksen & Flight Level Engineering

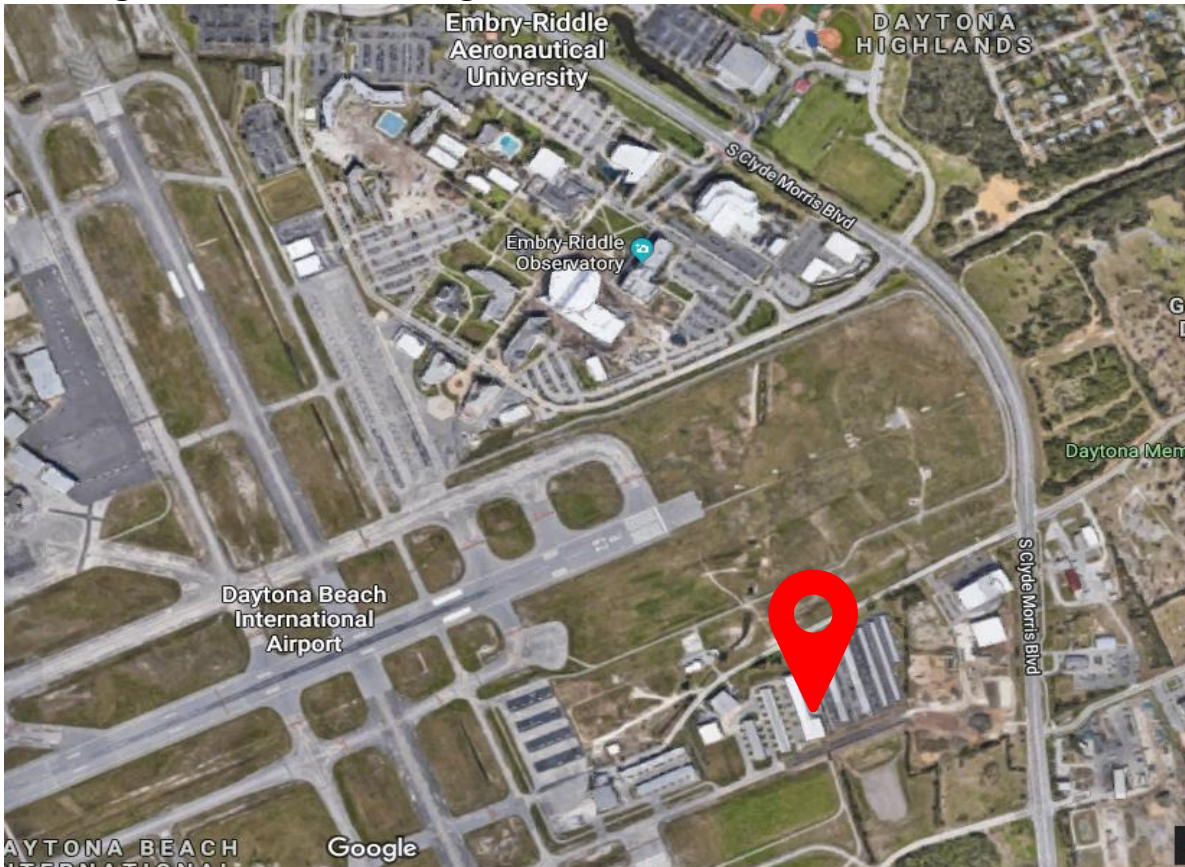
What Flight Test Research Demonstrated:

1. The flight control system (including inceptors), displays, and the navigation system are inextricably linked.
2. When building a clean sheet integrated system all 3 elements (controls, displays, and navigation system) influence each other and must be developed as a package in conjunction with each other.





Parking Directions for Hanger Tour



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