FUTURE FLIGHT DESIGN (FFD): An International Competition On Designing Aerial Robotic Vehicles for the Future

Y. Volkan Pehlivanoğlu
Turkish Air Force Academy
Istanbul, Turkey

Abdurrahman Hacıoğlu
Turkish Air Force Academy
Istanbul, Turkey

CONTENTS

- A Brief History of FFD
- FFD 2011
- FFD 2013
- Remarks and Conclusions

A BRIEF HISTORY OF FFD

- Future Flight Design (FFD) competition is an international competition on designing aerial robotic vehicles for the future.
- The contest was founded as a “hands on” student experience to improve their knowledge and ability to work in an industry environment or in an air force after graduation.
- Additionally, FFD is to provide a platform of opportunities to bring about different and original designs designed within the scope of the development incentives of Unmanned Aerial Vehicles (UAVs).

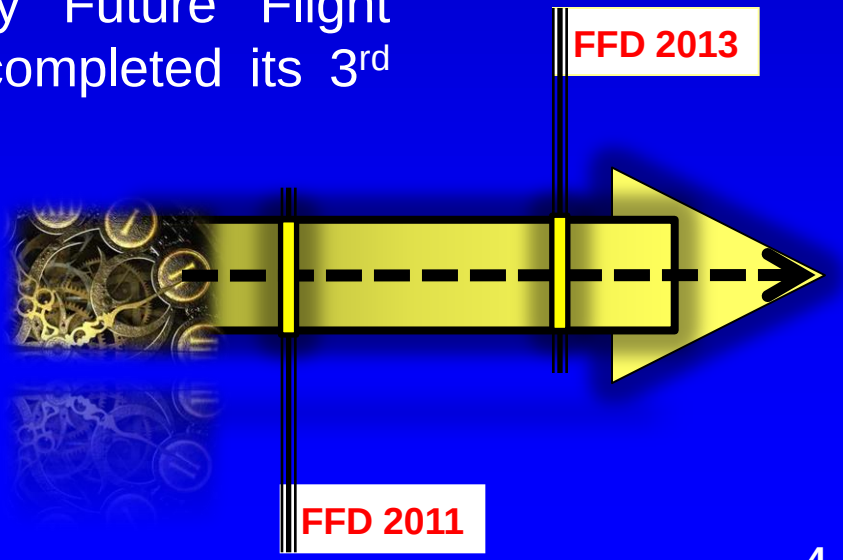
A BRIEF HISTORY OF FFD

- The first Future Flight Design Competition (FFD 2011) organized by the Turkish Air Force Academy to commemorate the centennial anniversary of the Turkish Air Force.

- It was held in Istanbul Hezarfen Airport from May 12 to May 14, 2011.

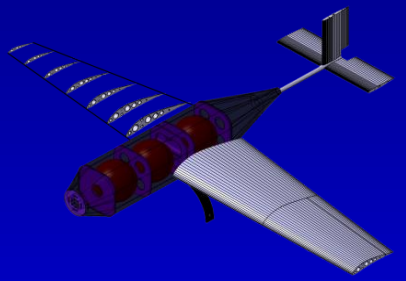
- The Turkish Air Force Academy Future Flight Design competition has recently completed its 3rd year by executing the FFD 2013.

- It was held in Istanbul Hezarfen Airport from May 10 to May 12, 2013.



A BRIEF HISTORY OF FFD

- The vehicle for this competition is an unmanned aerial vehicle (UAV).



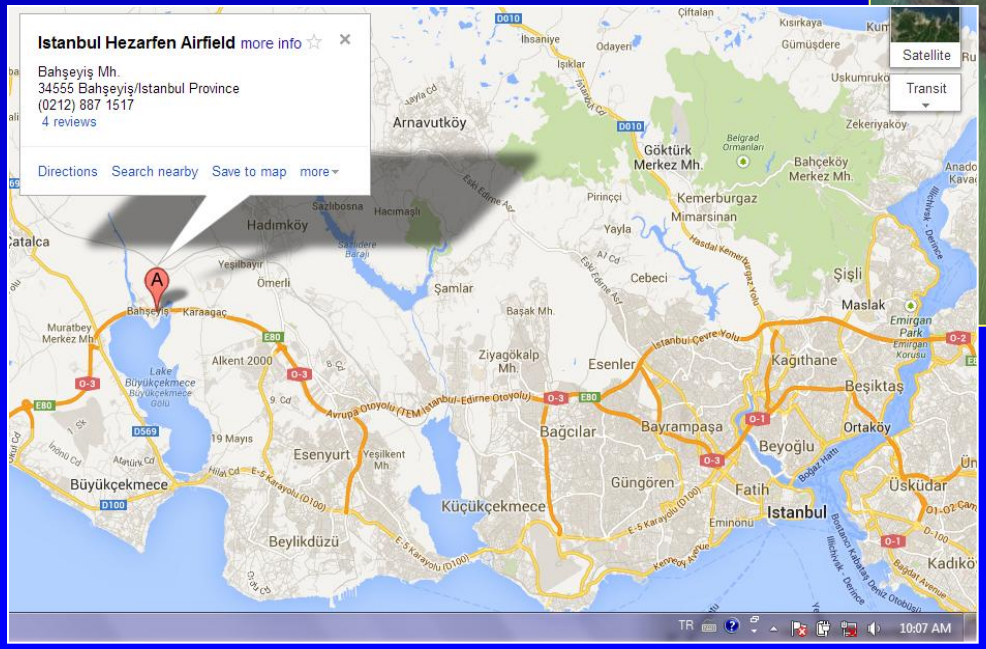
- It is to design, manufacture, and fly an electric radio controlled airplane to complete some specified missions related to range, payload, speed, and etc.

- The champion and the order are determined by the best combination of grading related to written report, UAV package, and flight performance.

FFD 2011

- FFD 2011 is the first FFD competition held on May 12-14, 2013 at Hezarfen Airport/Istanbul.
- Airport is on the peninsula near Küçükçekmece Lake.

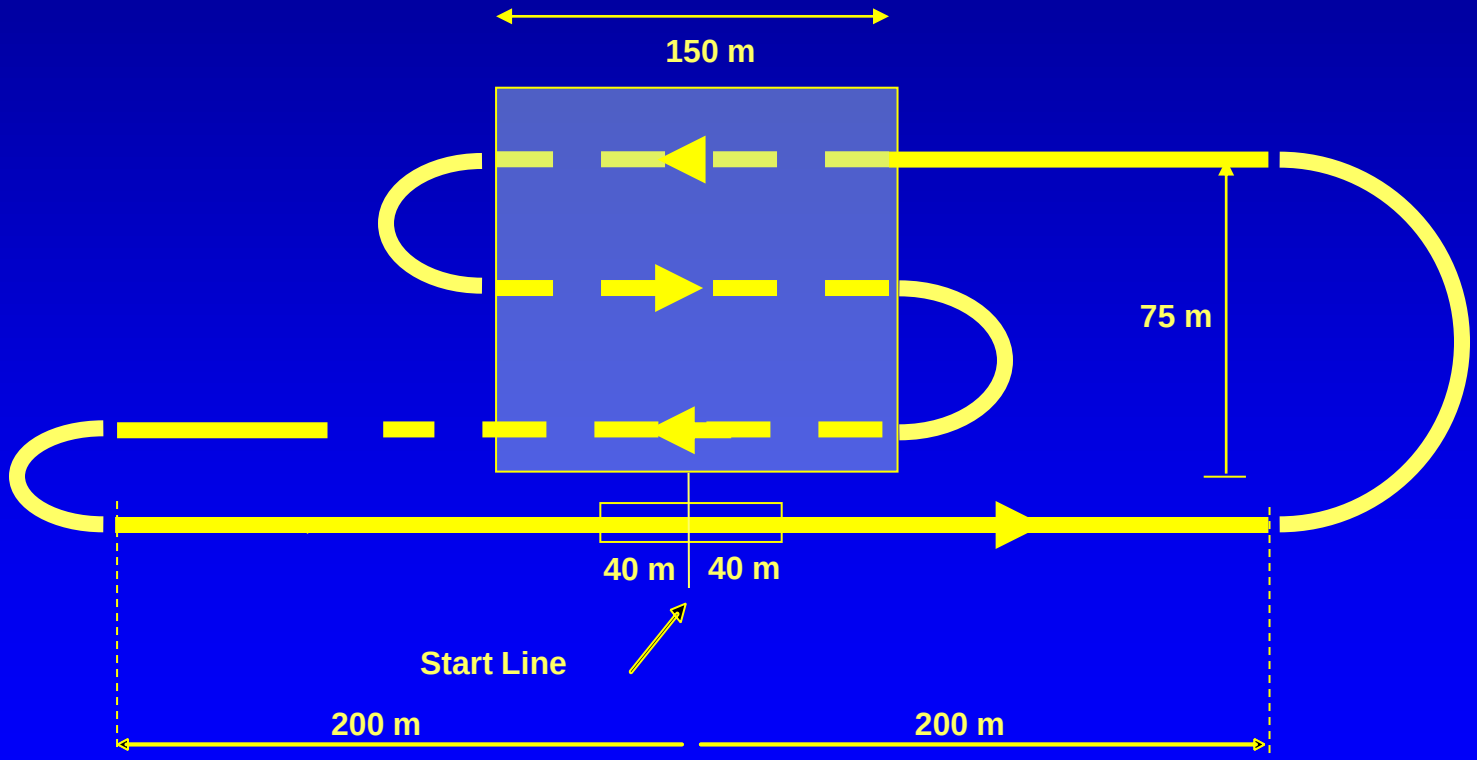
Hezarfen Airport/ Istanbul



FFD 2011

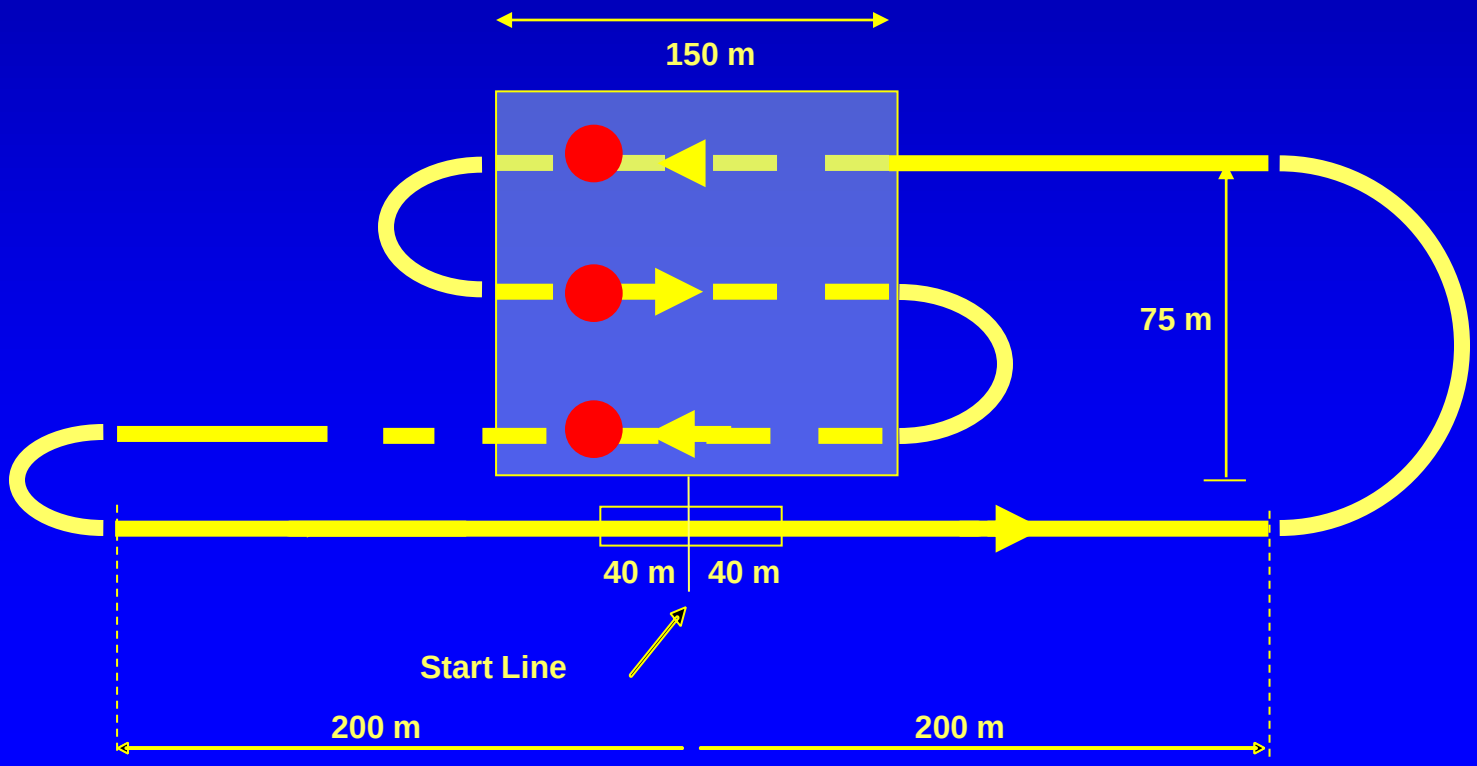
- The following categories completed the tasks;
  - Category I Original and autonomous air vehicles designed and constructed for this competition.
  - Category II Original radio-controlled aerial vehicles designed and constructed for this competition.
  - Category III Previously manufactured radio-controlled aerial vehicles modified for the competition.
- Main theme
  - Participating teams are going to control aerial vehicles to reach a fire area in the flight arena and leave fire extinguisher balls over the area covered with a red line and return…

Mission-I : It includes an unloaded flight to determine fire areas.



Mission-II : It includes a flight loaded with a single ball and releasing the ball over the fire area in the 2nd flight segment.

Mission-III: Includes a single flight loaded with 2 or 3 balls to fire area and releasing each ball respectively.



FFD 2011

- 51 teams from 8 different countries applied for FFD 2011 and 27 teams joined.
- Total flight sorties: 112, 68 successful flight.
- Rankings;

Autonomous

1	**PHOENIX**	"Politehnica" University of Bucharest	
2	**LIGHTNING**	Turkish Air Force Academy	
3	-	-	-

Original

1	**FESA**	Turkish Air Force Academy	
2	**THY UBB**	Turkish Air Lines Technique	
3	**VECİHİ**	TOBB University	

Modified

1	**GÖKSENİN**	Turkish Air Force Academy	
2	**NOKAIR**	NOKSEL	
3	**CYPRUS EAGLES**	European University of Lefke	

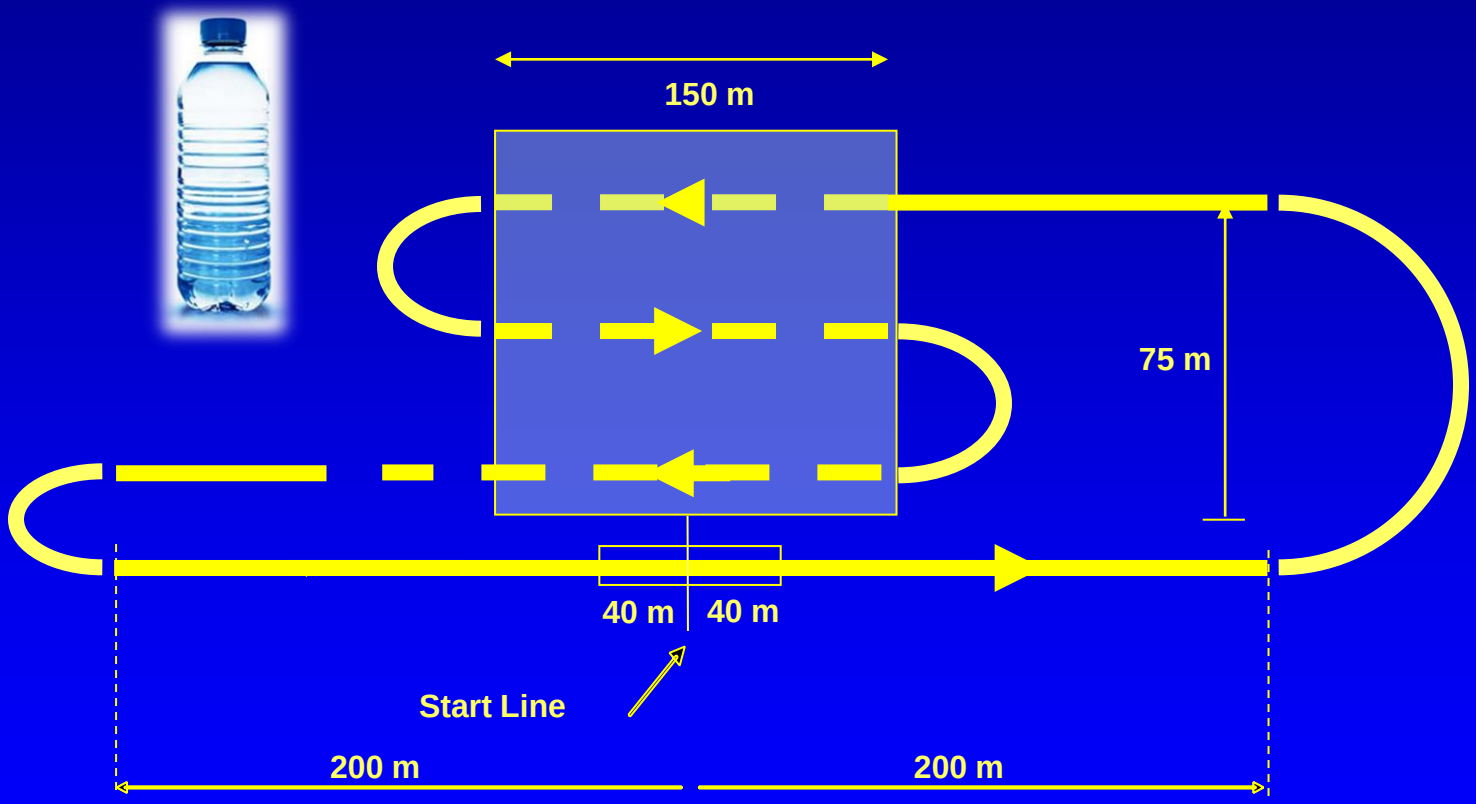
FFD 2013

- FFD 2013 is the second FFD competition held on May 10-12, 2013 at Hezarfen Airport/Istanbul.
- Aerial vehicles may be autonomous, previously manufactured autonomous, radio-controlled aerial vehicles, and previously manufactured radio-controlled aerial vehicles modified for this competition.
- All types are in the same category.
- The type of UAV affected the scoring.

THEME **MODULARITY**

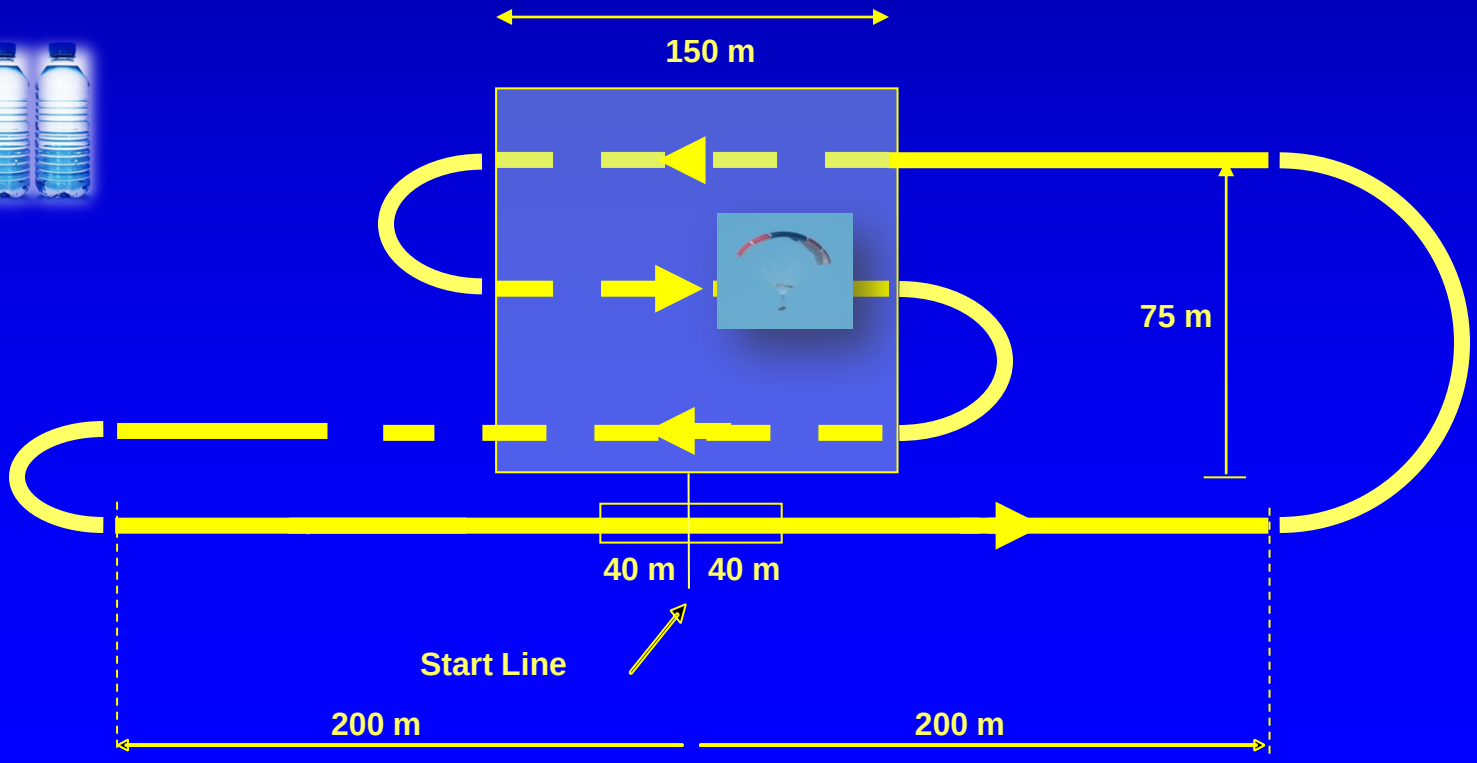
Modular employing or involving a module or modules as the basis of design or construction that best fits for the mission.

Mission-I : It includes a flight with 1-bottle payload.



Mission-II : A UAV is modified (Modularity Theme) for the specified mission. It includes a flight with 4-bottle payload.

Mission-III: Base or modified UAV may fly. It includes a flight with 3-bottle payload to the target area and dropping them in order (in each flight segment) inside the target area. Payload landing with a parachute.



New concepts in FFD 2013

A modularity Factor is a multiplier and computed using the formula;

$$Modularity\ Factor = \frac{(w_2 - w_{12}) * dw}{w_2^4 + w_{12}}$$

Where

w_2 : Maximum empty weight of an aircraft for mission 2 and 3.
w_{12} : The weight of modular parts added to base aircraft.
dw : The difference between empty weight of base aircraft and w_2.

A volume score is a score based on the case volume and computed using the formula;

$$Volume\ Score = 100 * \frac{V_{ref}}{V_{team}}$$

where V_{ref} is the lowest case volume recorded for any team that successfully completes the mission and V_{team} is the case volume recorded for that team.

FFD 2013

- 24 teams from 5 different countries applied for FFD 2013 and 27 teams joined.
- Total flight sorties: 51, 24successful flight.
- Rankings;

1	**OTONOM AMUK**	**ANKARA MODEL A/C CLUB & METU**	
2	**LAGARİ**	**BURSA TECHNICAL UNIVERSITY & TOPHANE EML**	
3	**AMUK**	**ANKARA MODEL A/C CLUB & BILKENT UNIVERSITY**	

CONCLUSIONS

- Future Flight Design competition has become a traditional competition in Turkey.
- It also attracts international attention from other countries.
- It is a good chance to get a deep experience in the area of a UAV design for the students.
- The next FFD will possible be held on May 2014 in Istanbul.
- Organization committee needs more attention from aviation industry and aerospace related universities.

Thanks..!

FUTURE FLIGHT DESIGN (FFD):
An International Competition On Designing Aerial Robotic Vehicles for the Future

Y. Volkan Pehlivanoğlu
Turkish Air Force Academy
Istanbul, Turkey

Abdurrahman Hacıoğlu
Turkish Air Force Academy
Istanbul, Turkey