



Dror Artzi



Dror Artzi Aeronautical Engineer דרור ארצי
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**העתיד כבר כאן
האומנם?**

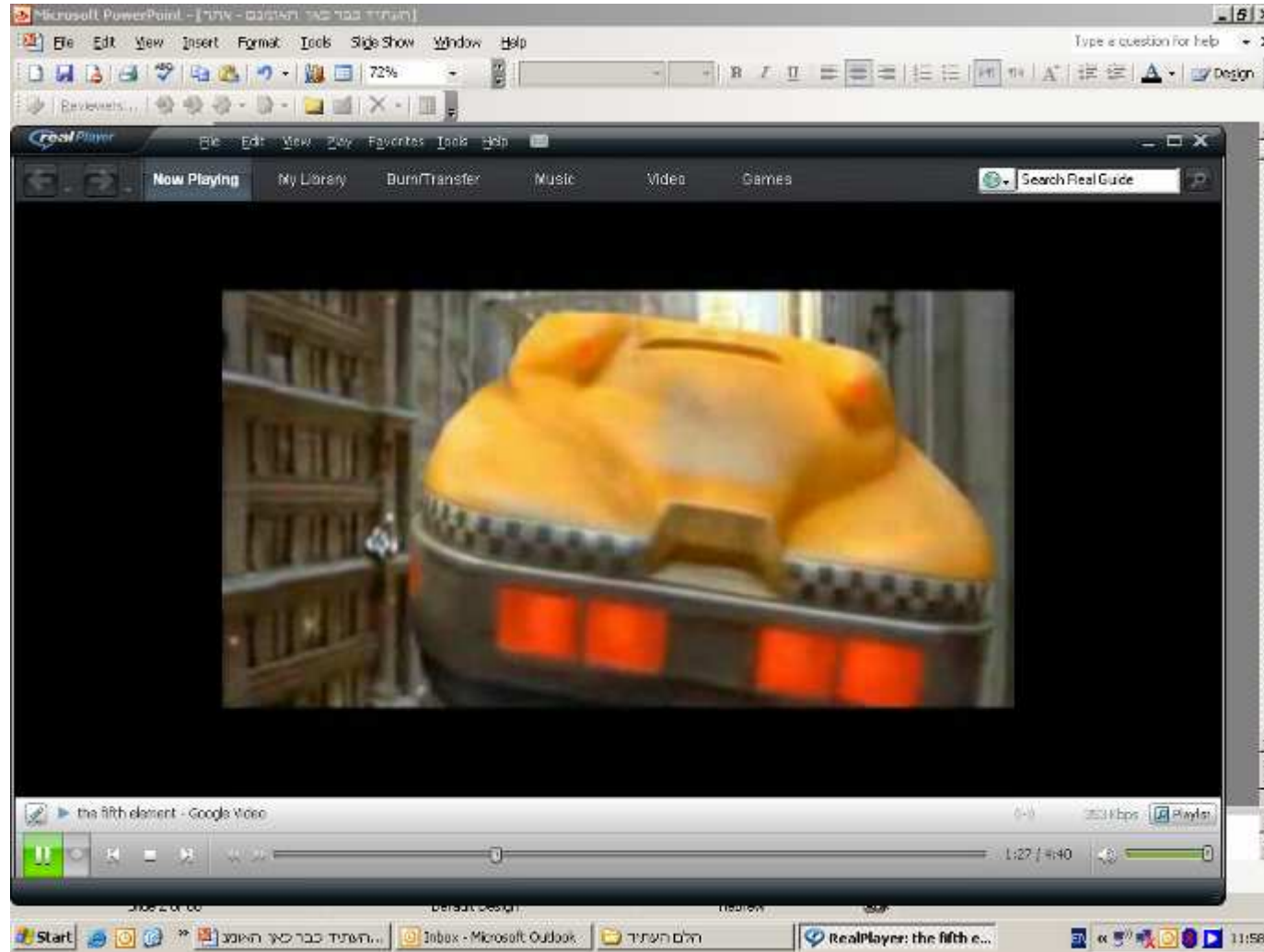
**The Future is here
Isn't it ?**

The Future is here – isn't it ?



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The Fifth Element

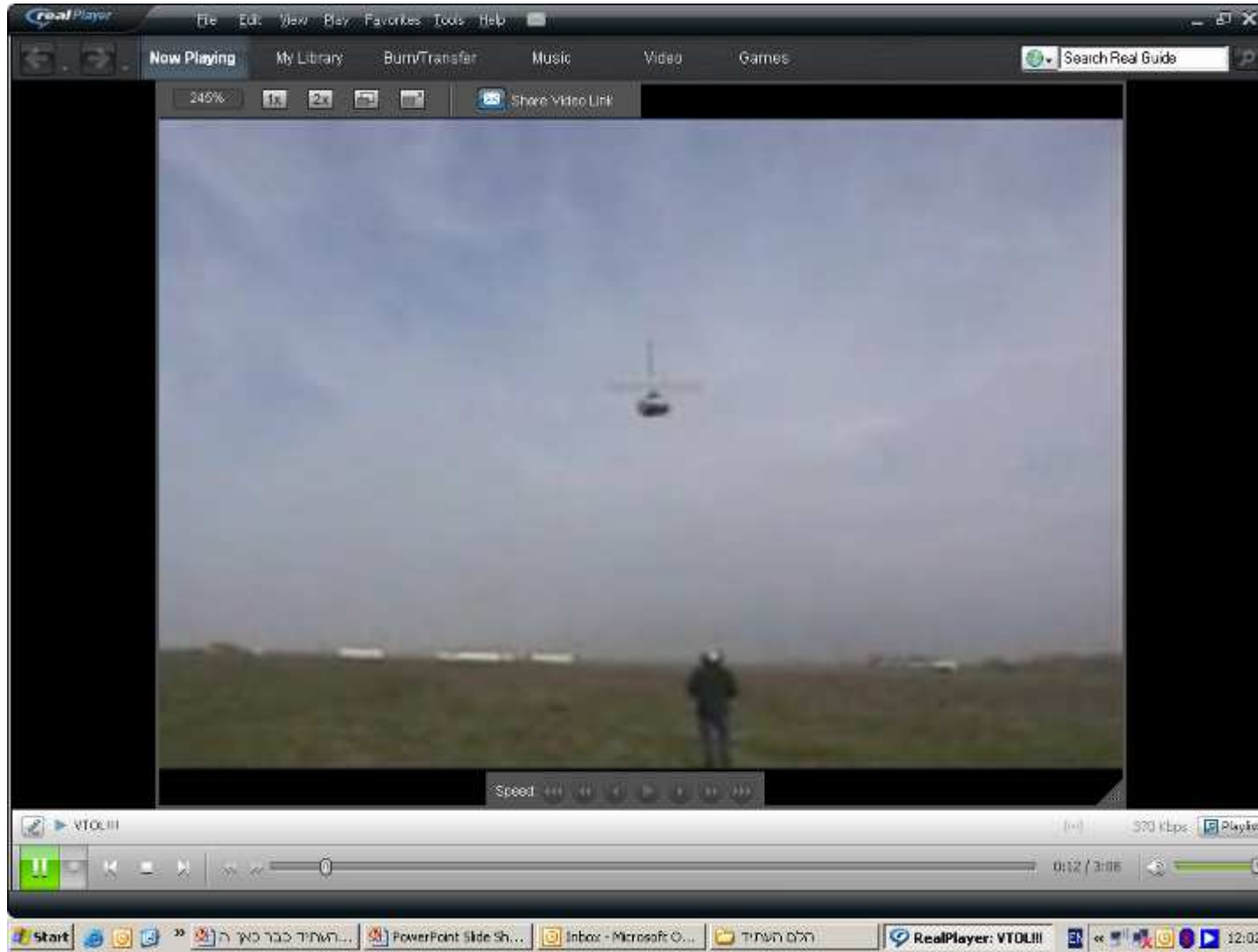


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Few years ago VTOL UAV



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ISTAR



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Hover, Low-Speed



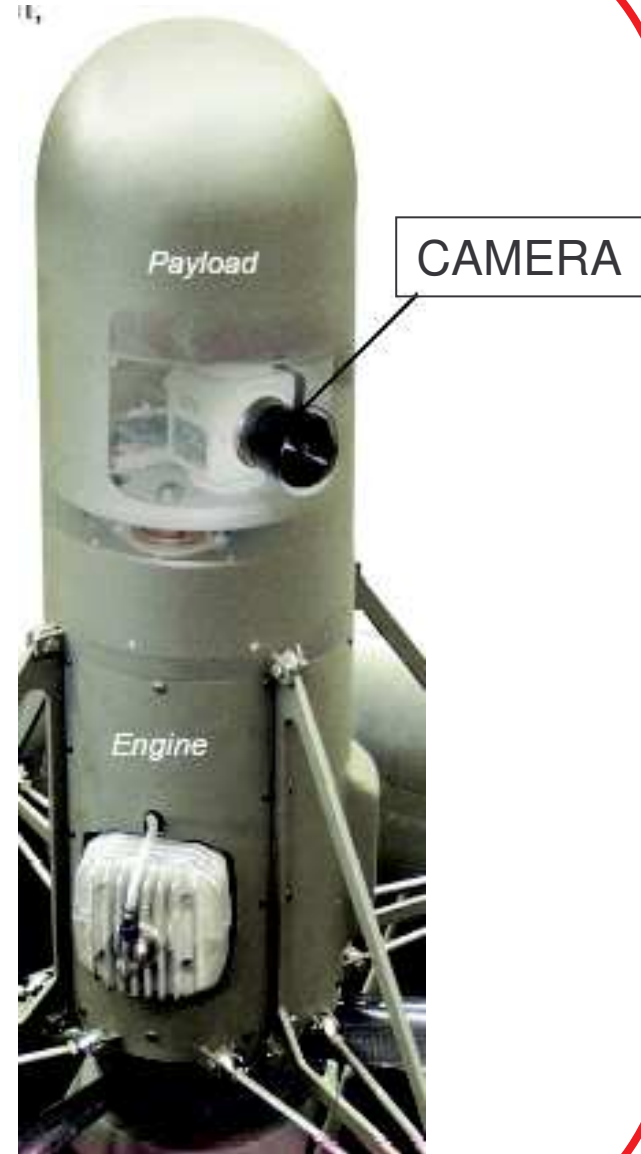
Intermediate Speed



High-Speed Flight



Air flows through duct, providing lift and control



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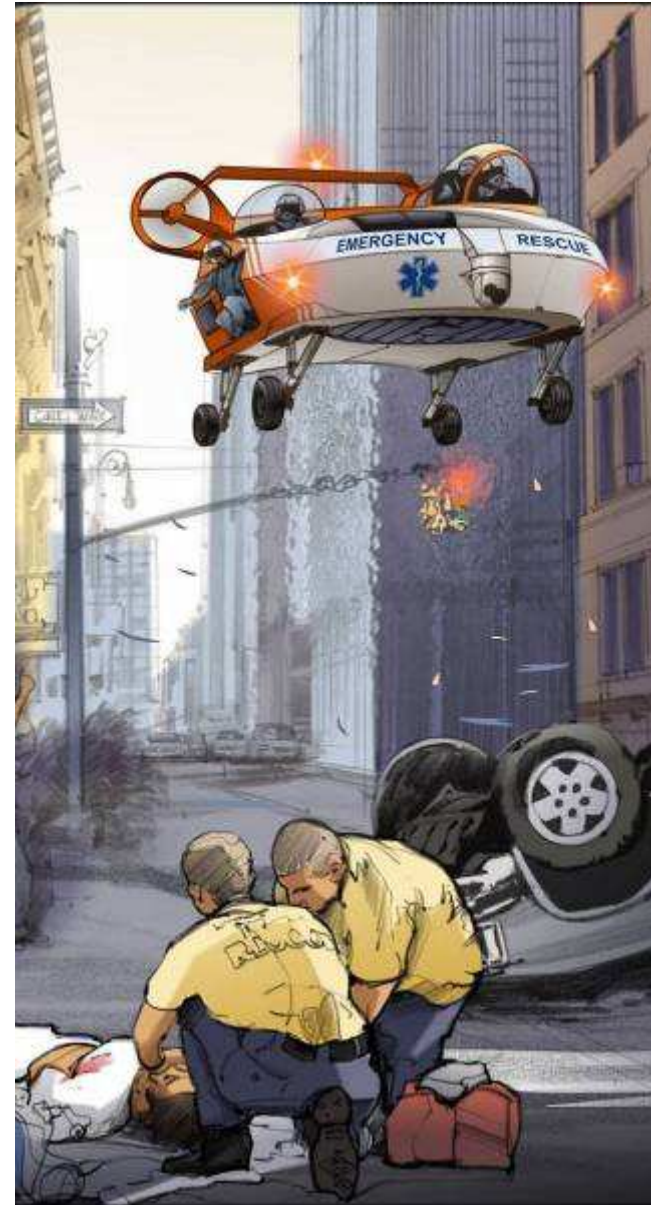
Problem Statement:

Helicopters are limited in Urban areas:

- Main issue: Large rotors & exposed rotor blades

Urgently needed:

- An *Internal rotor* Civil Urban Rescue vehicle
- An *Internal rotor* Military troop carrier



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Bell Helicopter Pavilion
Farnborough, July 2006



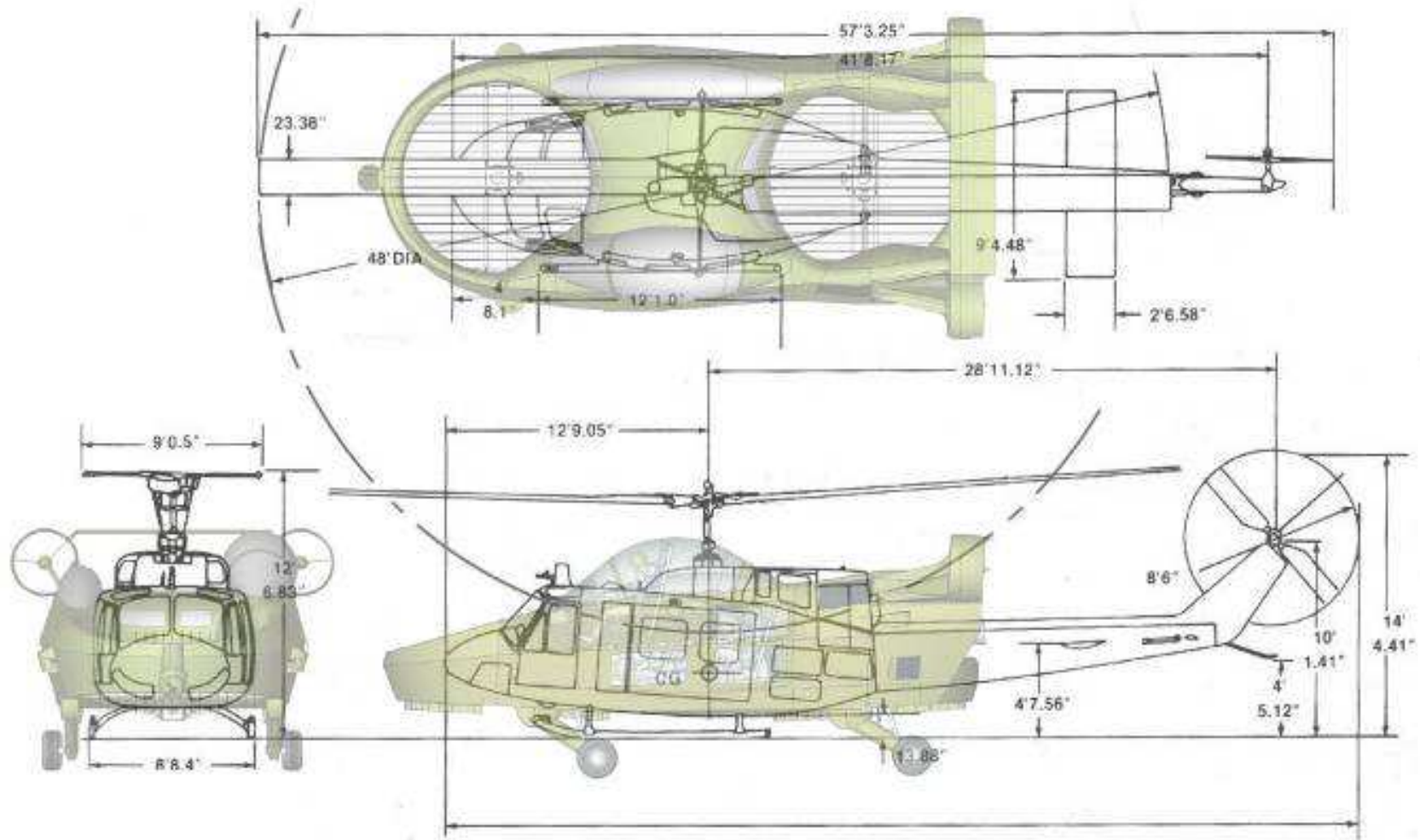
Year 2008 Civil 'X-Hawk'





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Manned 'X-Hawk' Fancraft™

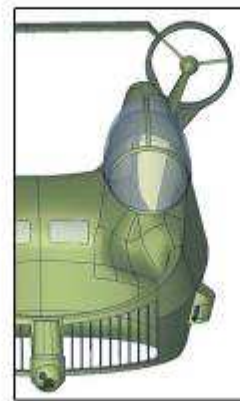
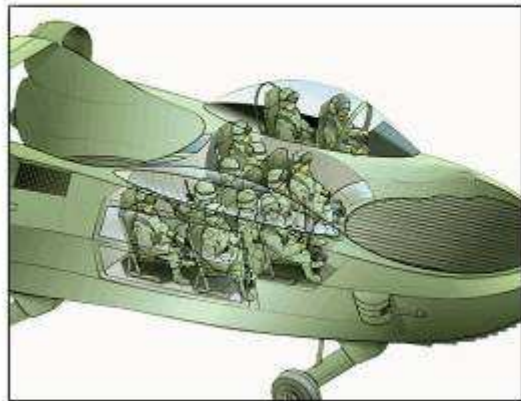
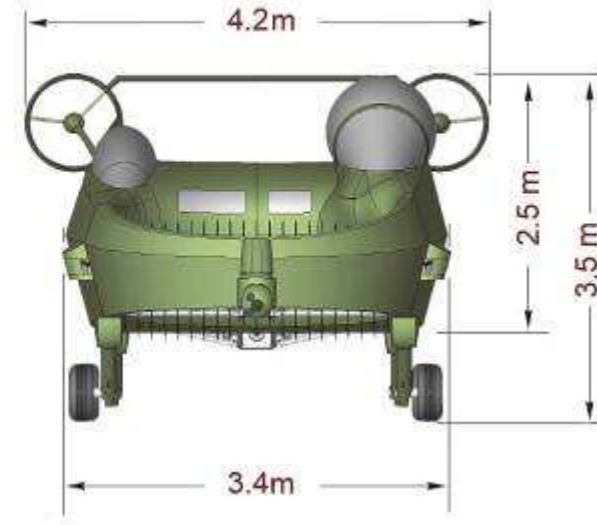
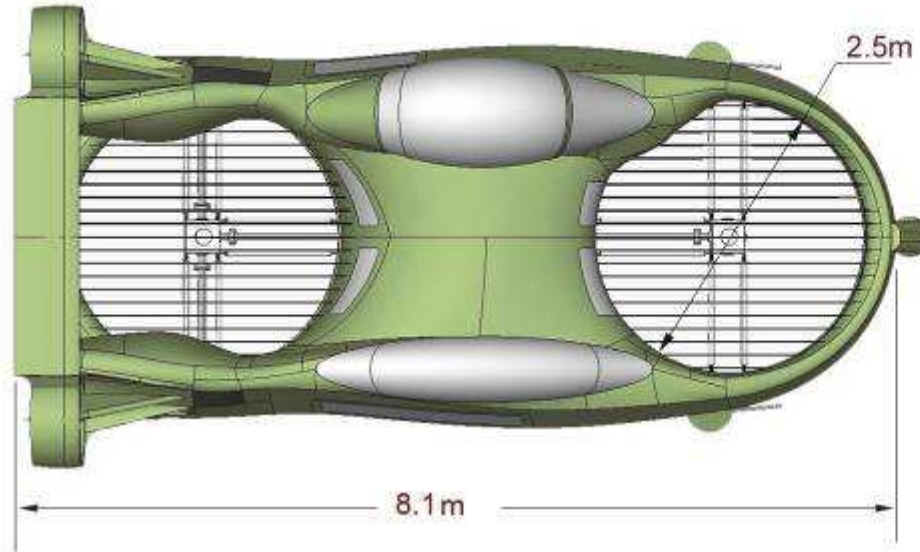


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Manned 'X-Hawk' Fancraft™



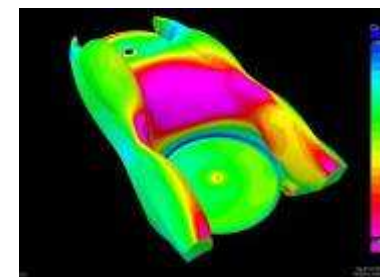
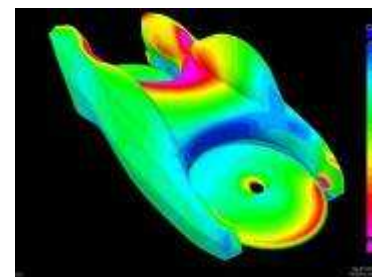
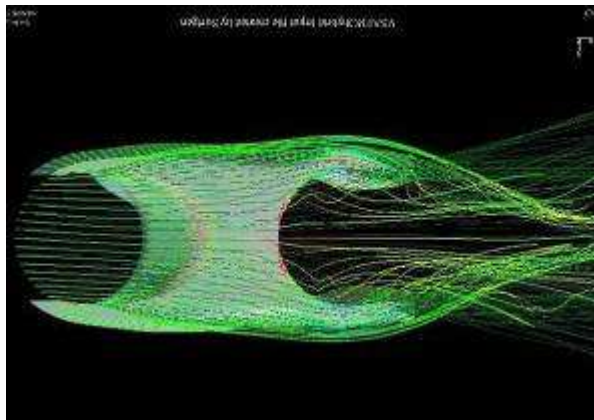
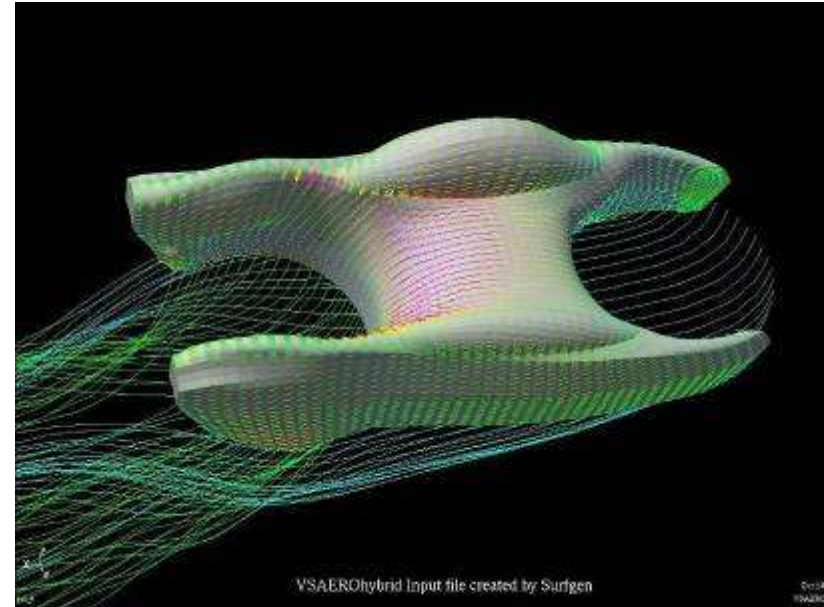
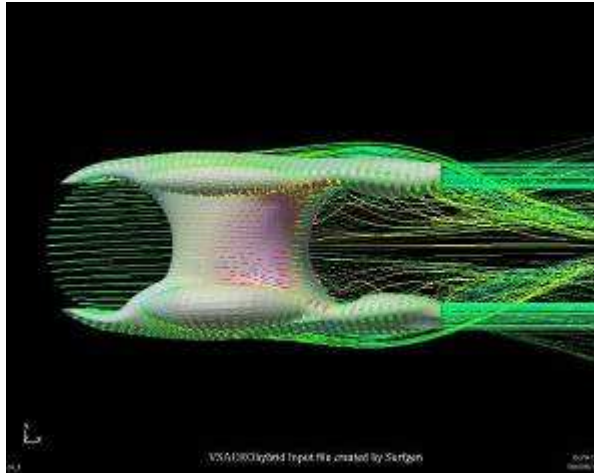
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First Flight Jan 23, 2003





Aerodynamic Analysis Using VSAERO computational tool



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X-Hawk Wind Tunnel Tests (University of Arizona, Aug. ,2005)



Specific Urban Aeronautics Proprietary & Confidential information in this slide is marked in Appendix A.

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SKYCAR

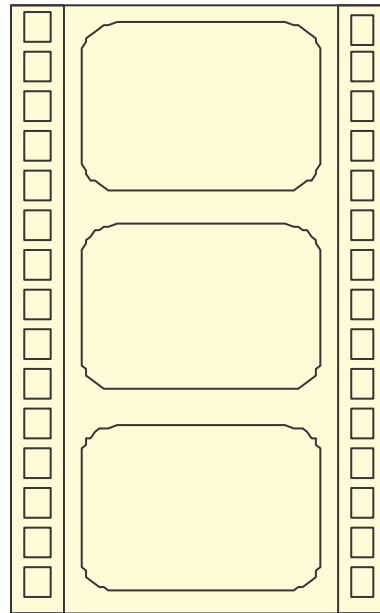


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So, Why not UAV

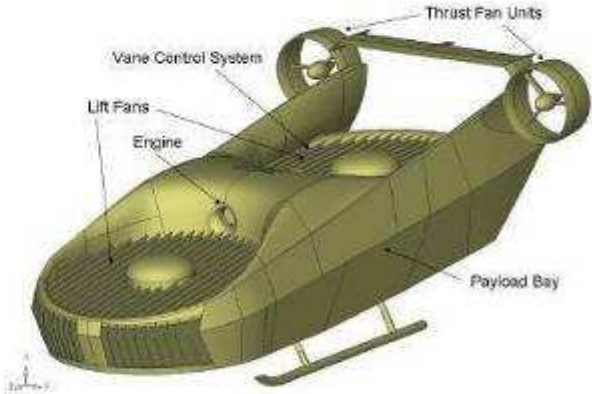


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'MULE' UAV



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AIR VEHICLE SPECIFICATIONS:

WEIGHTS [LBS.]	
Empty Weight	1,400
Typical Fuel weight	500
Useful Payload @ Typical Fuel	500
Max Gross Takeoff Weight	2,400

PERFORMANCE	
Total engine Power (RR250-C30)	650 shp
Max Speed (Dash)	80-100 kts
Max Altitude	8,000 ft
Flight Endurance	2-4 hours (Depending on payload)

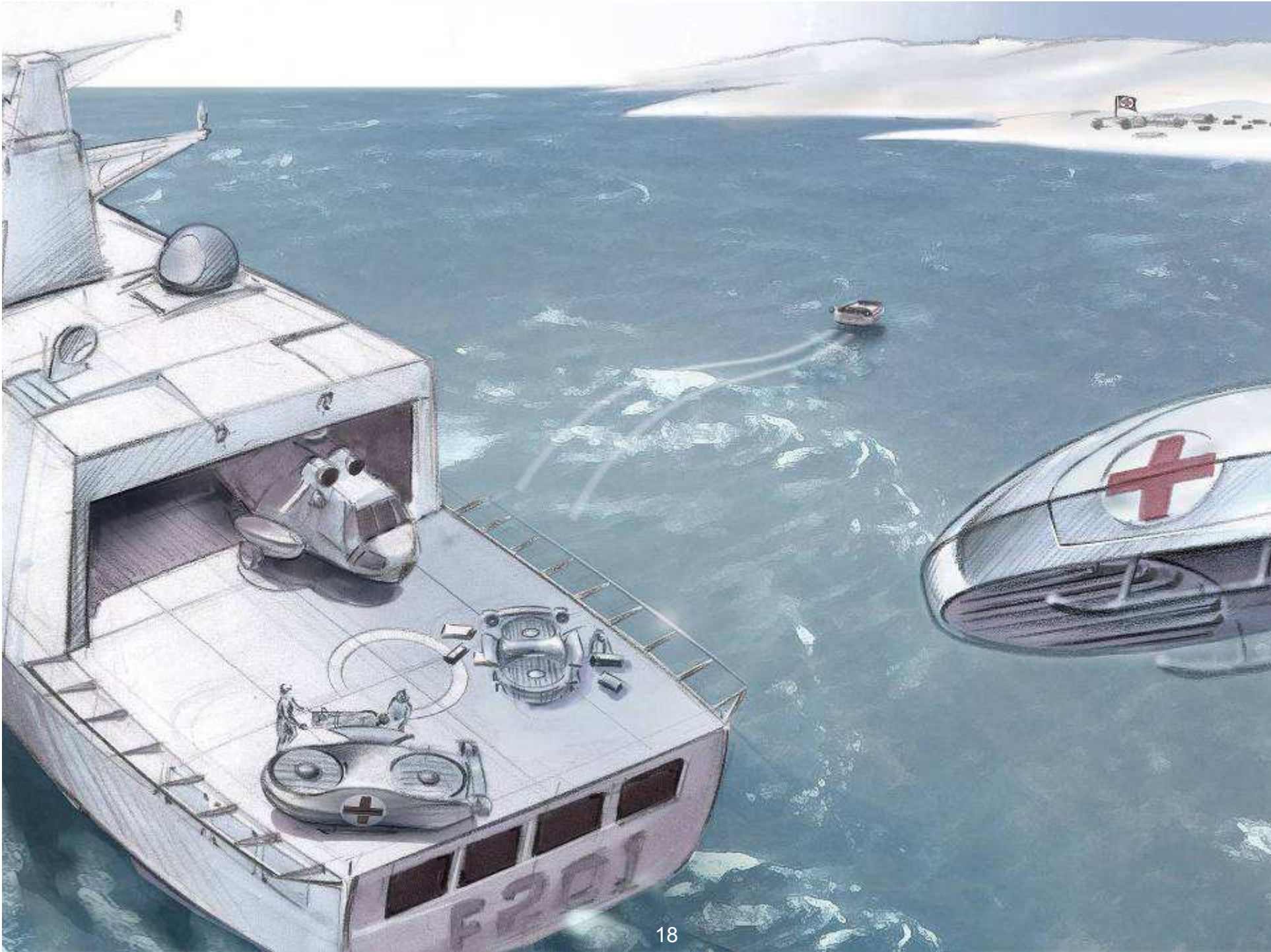
DIMENSIONS (meters)	
	5.3L x 2.15W x 1.8H (Thrusters removed)

ROTOR DIAMETER (meters)	
	1.8

Note: Above estimates are preliminary and subject to change

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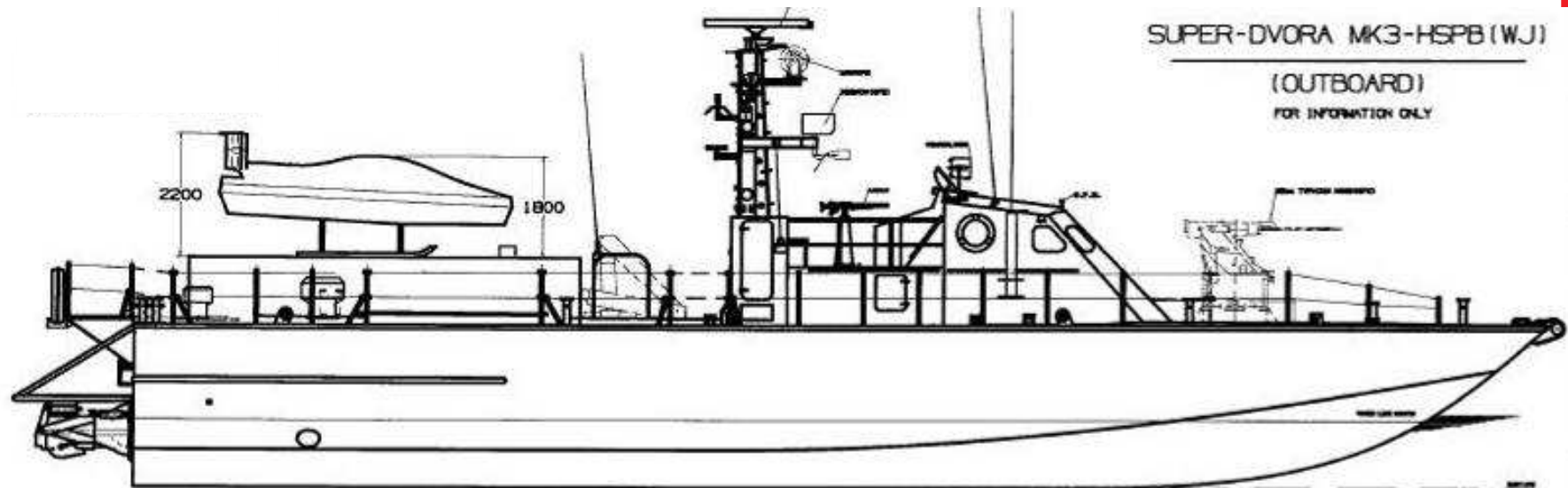
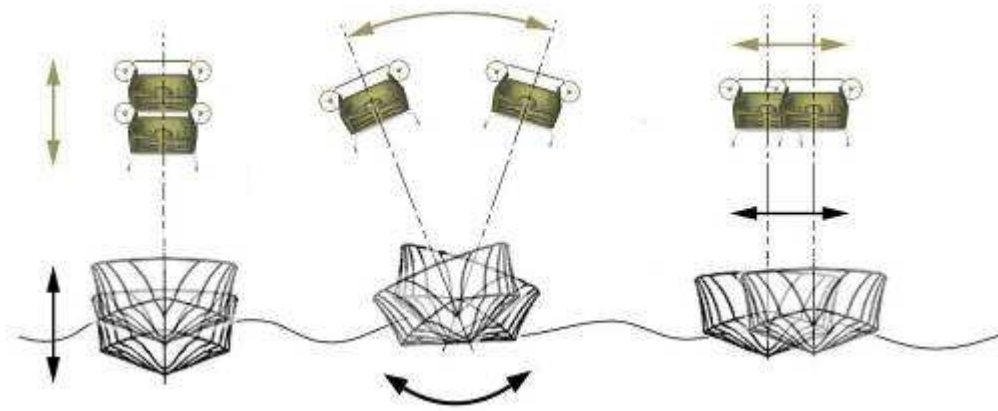






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Vane Control System
enables very precise deck
landings even on small
boats, rough sea & high
wind

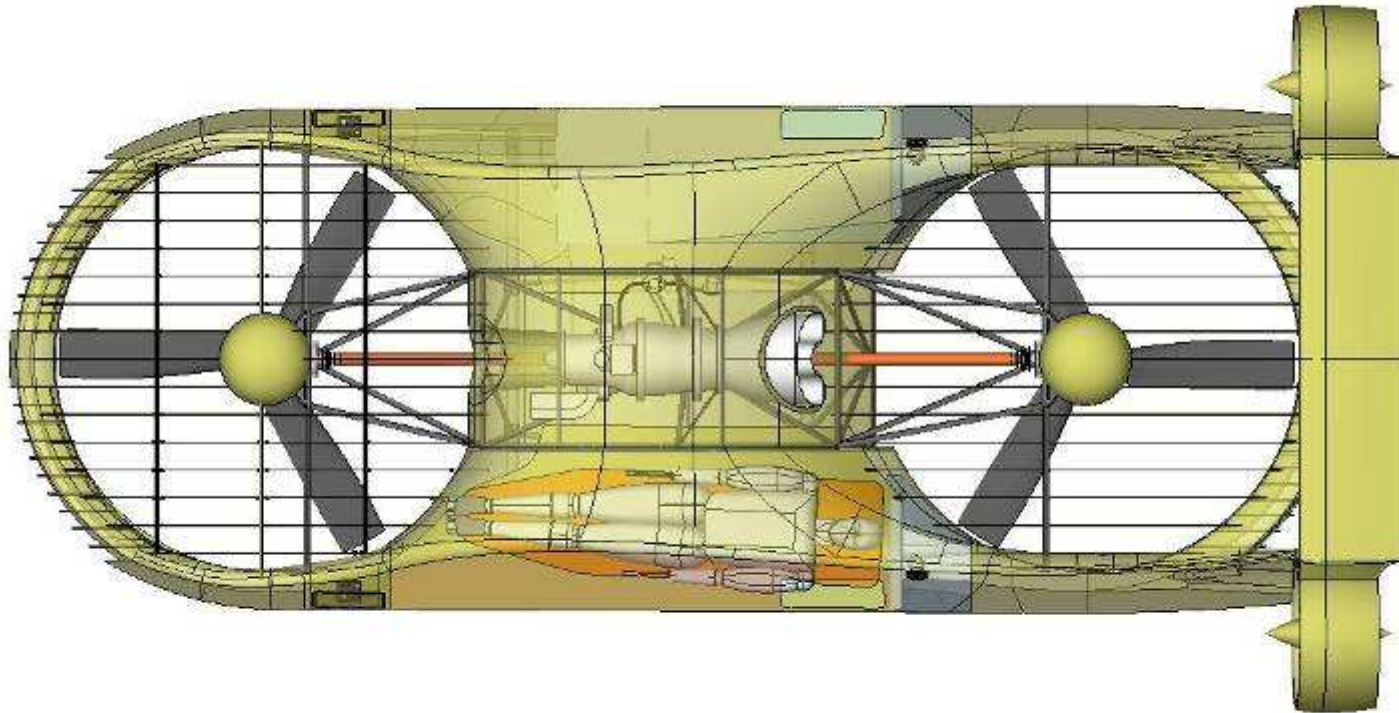


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MULE variant with Arriel 1D1



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'Mule' Wind Tunnel testing (Sept 2007)



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Landing Gear Structure Installation



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Engine Installation



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Going Smaller

URBAN
AERONAUTICS

'PANDA' UAV



AIR VEHICLE SPECIFICATIONS:

WEIGHTS [KG.]	
Empty Weight (no batteries)	6 Kg
Typical Batteries Weight (Li-Po)	7 Kg
Useful Payload @ Typical Batt.	1 Kg
Max Gross Takeoff Weight	14 Kg
PERFORMANCE	
Total engine Power (Electric)	6 shp
Max Speed	30-50 kts
Max Altitude	8,000 ft
Flight Endurance	30 minutes (Typical Batt)
DIMENSIONS (meters)	
	1.5L x 0.8W x 0.6H
ROTOR DIAMETER (meters)	
	0.5

Note: Above data is preliminary and subject to change

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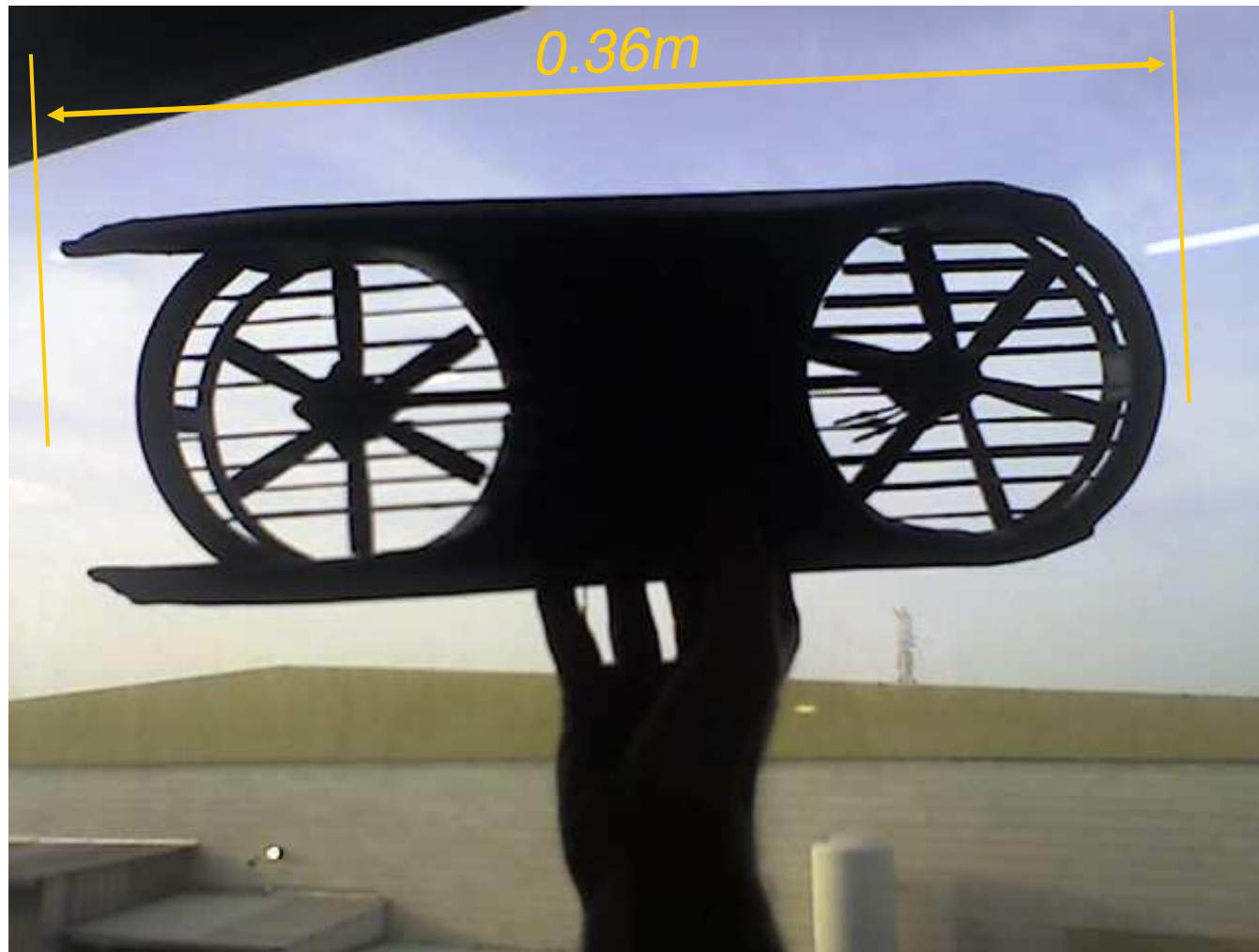




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And Smaller

In the works... Baby PANDA



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HONEYWELL MICRO AIR VEHICLE



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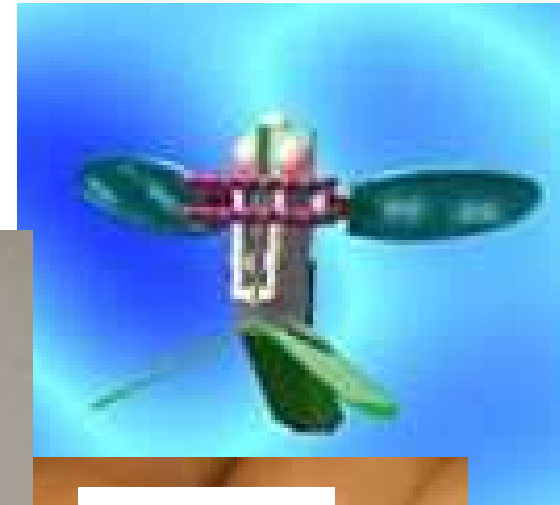
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And Much Smaller

רחפן יפני זעיר



Micromechanical flying insect (MFI)



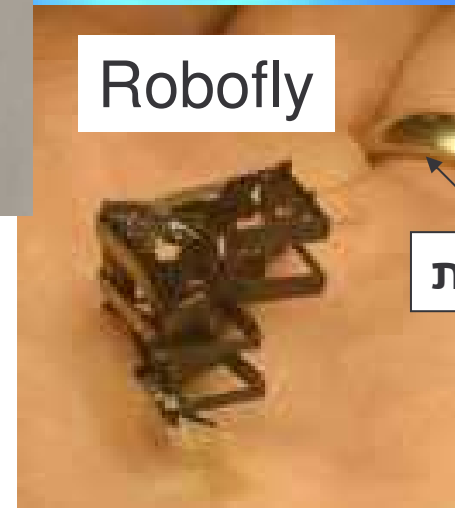
WASP



מוסקיטו



Robofly



טבעת

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BIONIC HORNET



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MAVSTAR

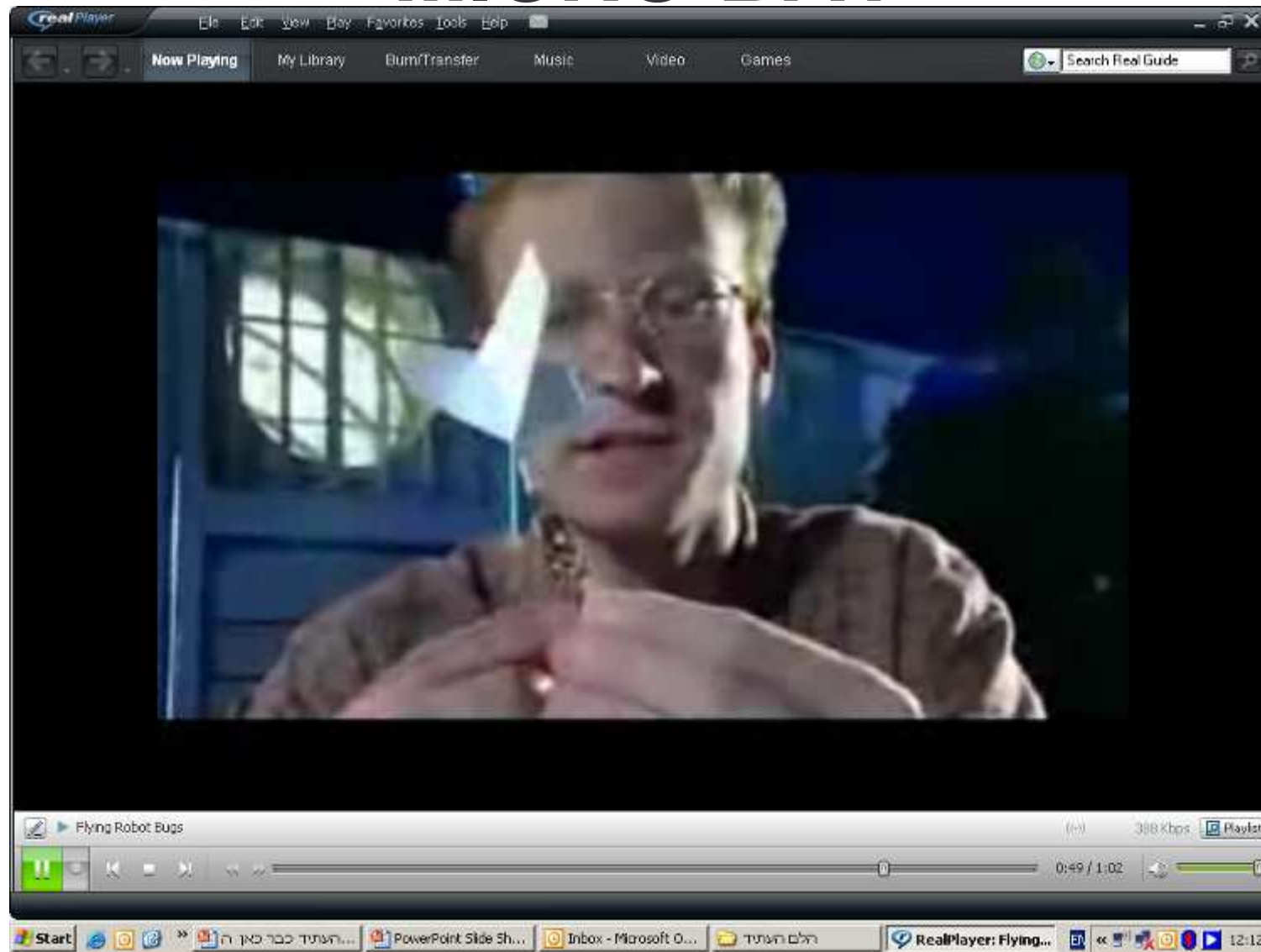


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MICRO BAT

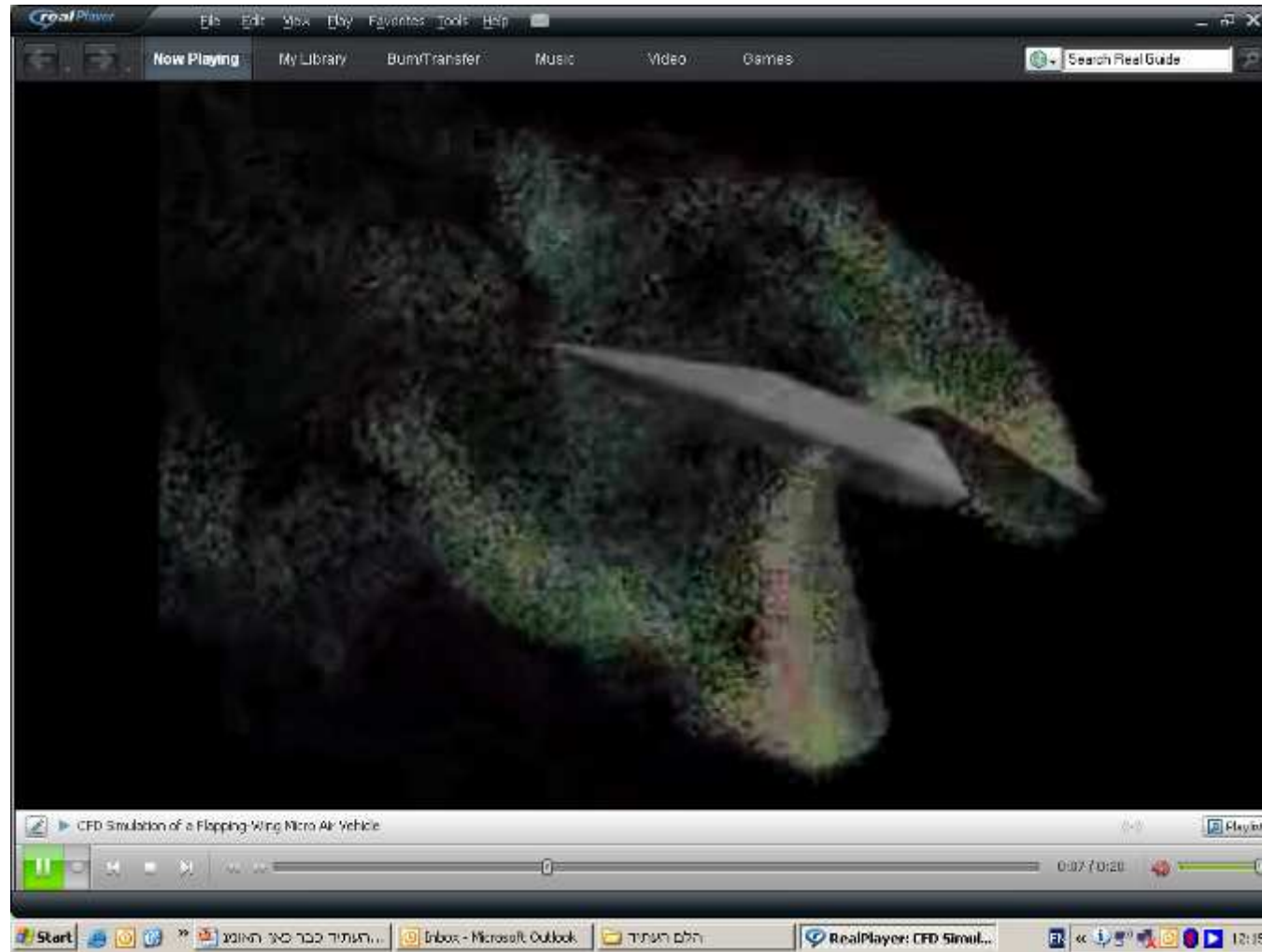


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CFD SIMULATOR OF A FLAPPING-WING FOR MICRO AIR VEHICLE



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KILLER BEE



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Swarm Theory



The Genius of Swarms

**A single ant or bee isn't smart, but their colonies are.
The study of swarm intelligence is providing insights
that can help humans manage complex systems,
.from truck routing to military robots**

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Project at MIT is looking at ways for swarms of UAVs to conduct persistent surveillance of an object or set of objects
UAVs take turns tracking objects; a small swarm of these "birds" can perform long-term surveillance.

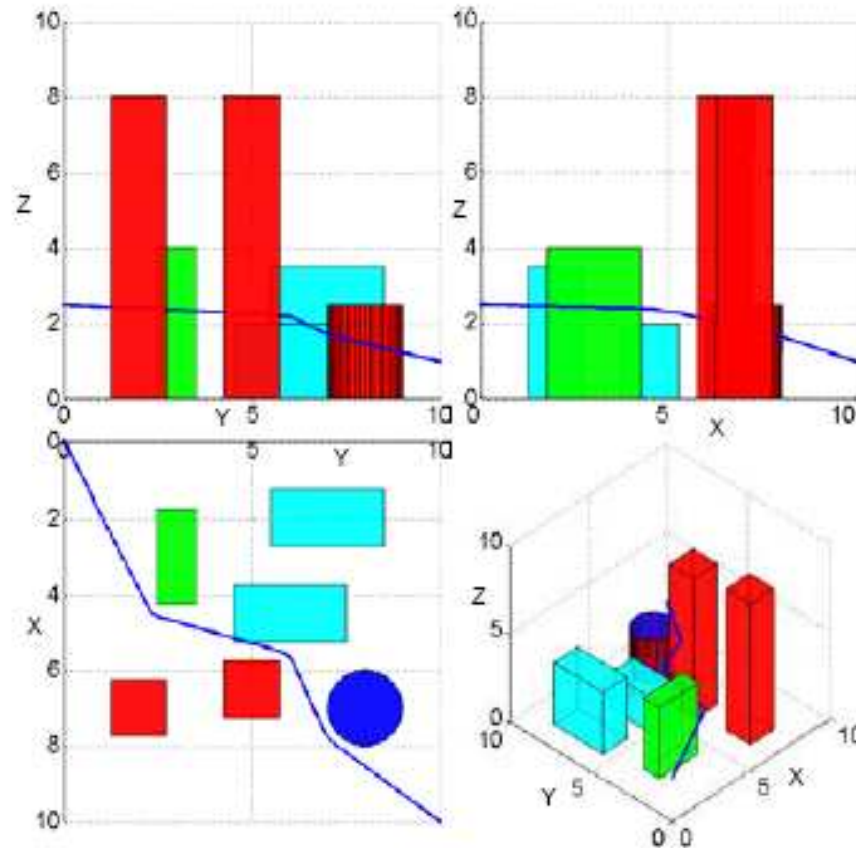
At any given time, some of the UAVs might be recharging or performing other tasks

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Optimal Path Planning and Control of Tactical Unmanned Aerial Vehicles in Urban Environments



Open-Loop UAV Kinematic Trajectory through Urban Environment.

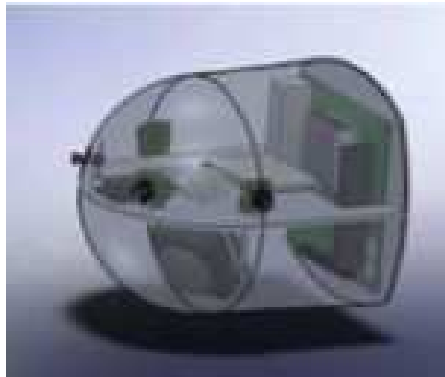
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Sense and Avoid System

- 4 cameras to cover (Lateral $\pm 110^\circ$, Longitude $\pm 15^\circ$)
- 1 radar Mounted on a gimbal covering (Lateral $\pm 110^\circ$, Longitude $+15^\circ/-90^\circ$)
- one powerful processing unit



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מערכת שליטה אוטונומית לתפעול להקות של מל"טים

UNMANNED VEHICLES, דצמבר 2006-ינואר 2007, עמ' 28-30

MIT מפעילה מסל"טים בפרוייקט הנחיל המוטס

UVONLINE, 12 בפברואר 2007

שו"ב אחד למל"טים

JANE'S DEFENCE WEEKLY, 8 בנובמבר 2006

קבוצה במשרד ההגנה האמריקני מציעה תקיפה אוטונומית

ע"י כטב"ם

JANE'S DEFENCE WEEKLY, 11 באוקטובר 2007

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Killer Bee - Wind Tunnel Test



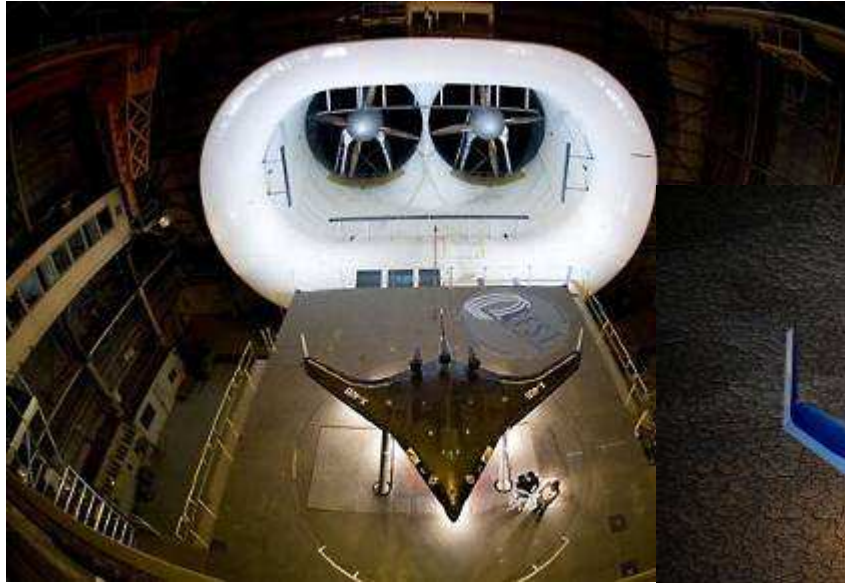
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Boeing X-48B Blended Wing Body

פיתוח תצורת כנף מעופפת למטוס נוסעים
מעבודות NASA עבור בואינג



NASA Dryden Flight Research Center Photo Collection

<http://www.dfrc.nasa.gov/Gallery/Photo/index.html>

NASA Photo: ED06-0201-2 Date: October 24, 2006 Photo By: Robert Ferguson (Boeing)

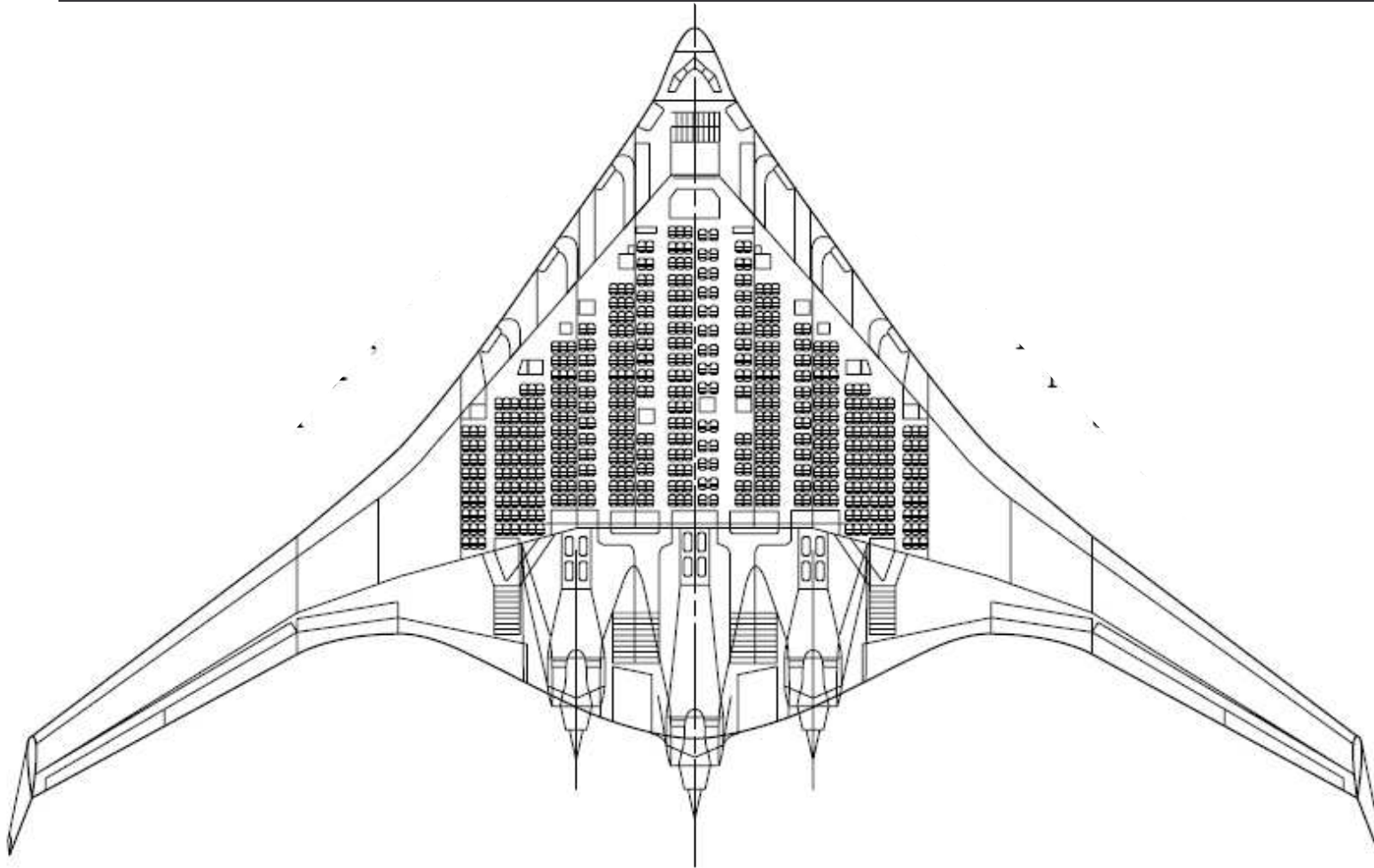
Boeing's X-48B Blended Wing Body technology demonstrator shows off its unique lines at sunset on Rogers Dry Lake adjacent to NASA DFRC.

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Double-Deck 529 Seats

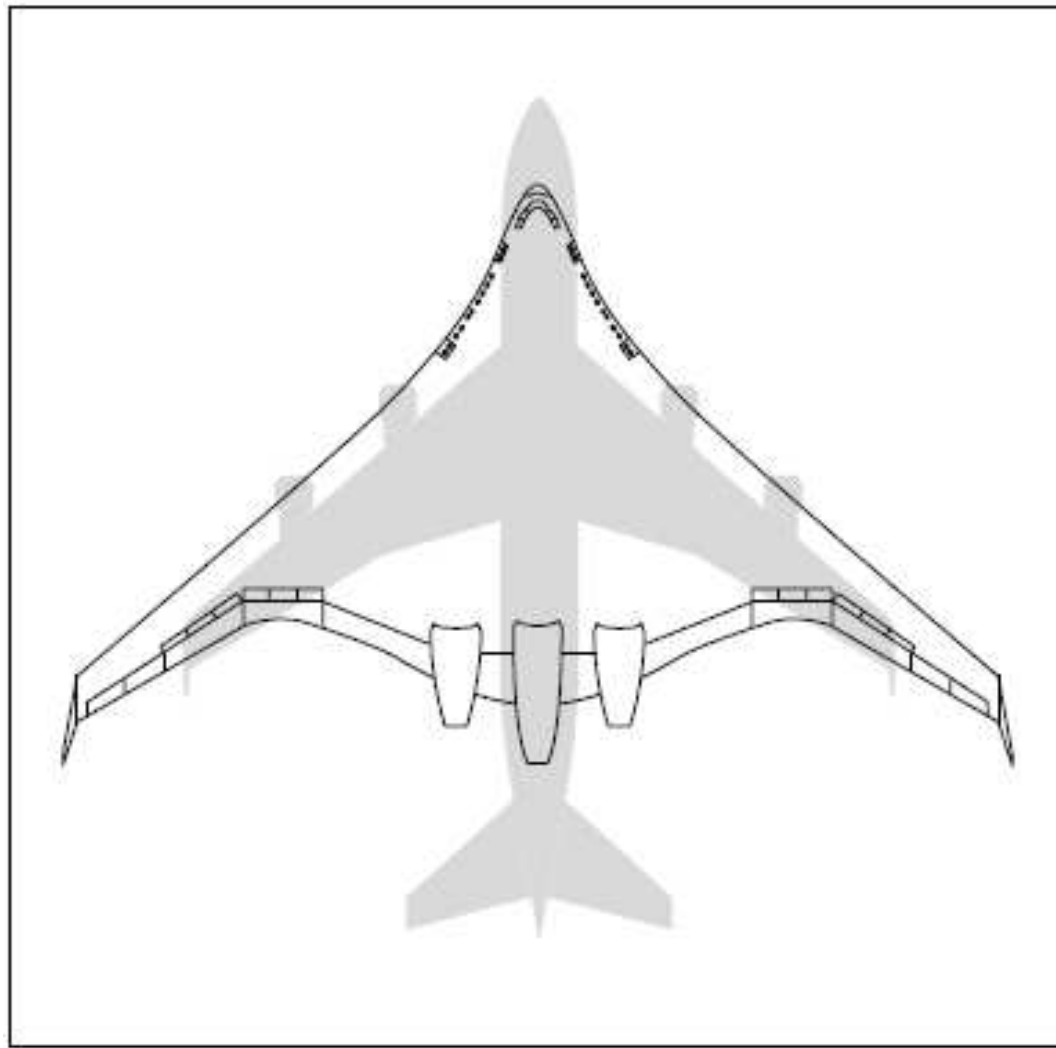


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67 feet wider than a Boeing 747-400

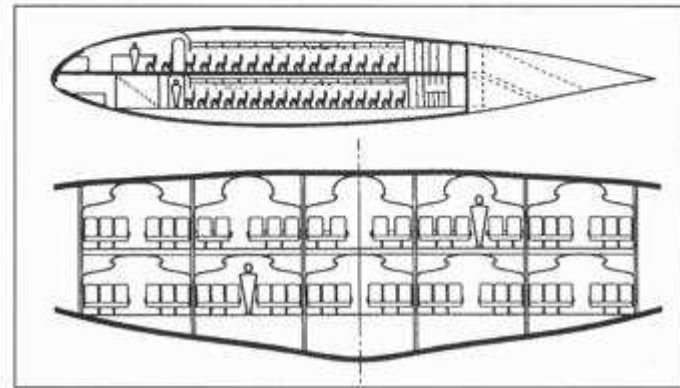
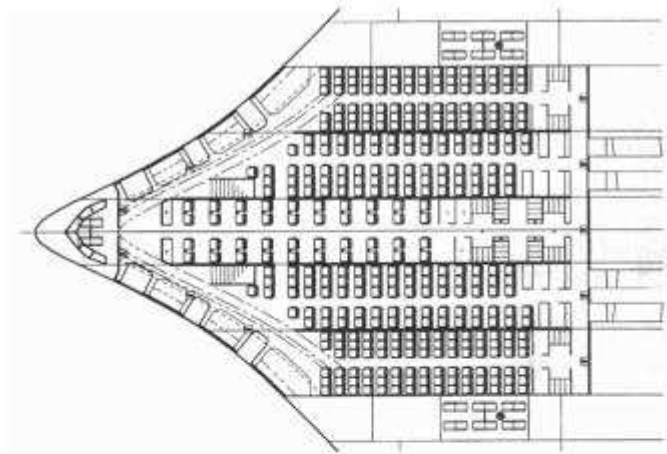


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BWB – Blended Wing Body



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New Boeing 797 Giant "Blended Wing" Passenger Airliner-**Fiction!**



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Armed UAV

כטב"מ חמוש

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NORTHROP GRUMMAN
Mission Systems



Why a Weaponized TUAV?

- Dull, Dirty, Dangerous Mission
- Self Contained Capability
 - ISR/Target/Attack/BDA
 - Precludes Targets Escaping While Awaiting Shooter
 - Shortens the Sensor to Shooter Chain
 - Experiences in Kosovo



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View from Hunter On-Board FLIR



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Viper Strike Increases Attack Options



•On Board Designation

- 2 Hunter Laser Designators available
- EO/Laser or IR/Laser
- Tri-Sensor Available soon

Off –board Designation (low clouds)

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Predator HELLFIRE/Stinger Aircraft



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PREDATOR UAV SYSTEM



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MQ-9, PREDATOR B UAV



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MQ-9 Reaper General Atomics

The UK Reapers' standard munitions fit includes GBU-12 laser guided bombs and AGM-114 Hellfire missiles



impressive sensor suite
precision-guided air-to-surface weapons

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MQ-9 Reaper General Atomics



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Norhtrop Grumman X-47



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EARLY CONFIGURATION OF X 47



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נורתרוף-גראמן X-47

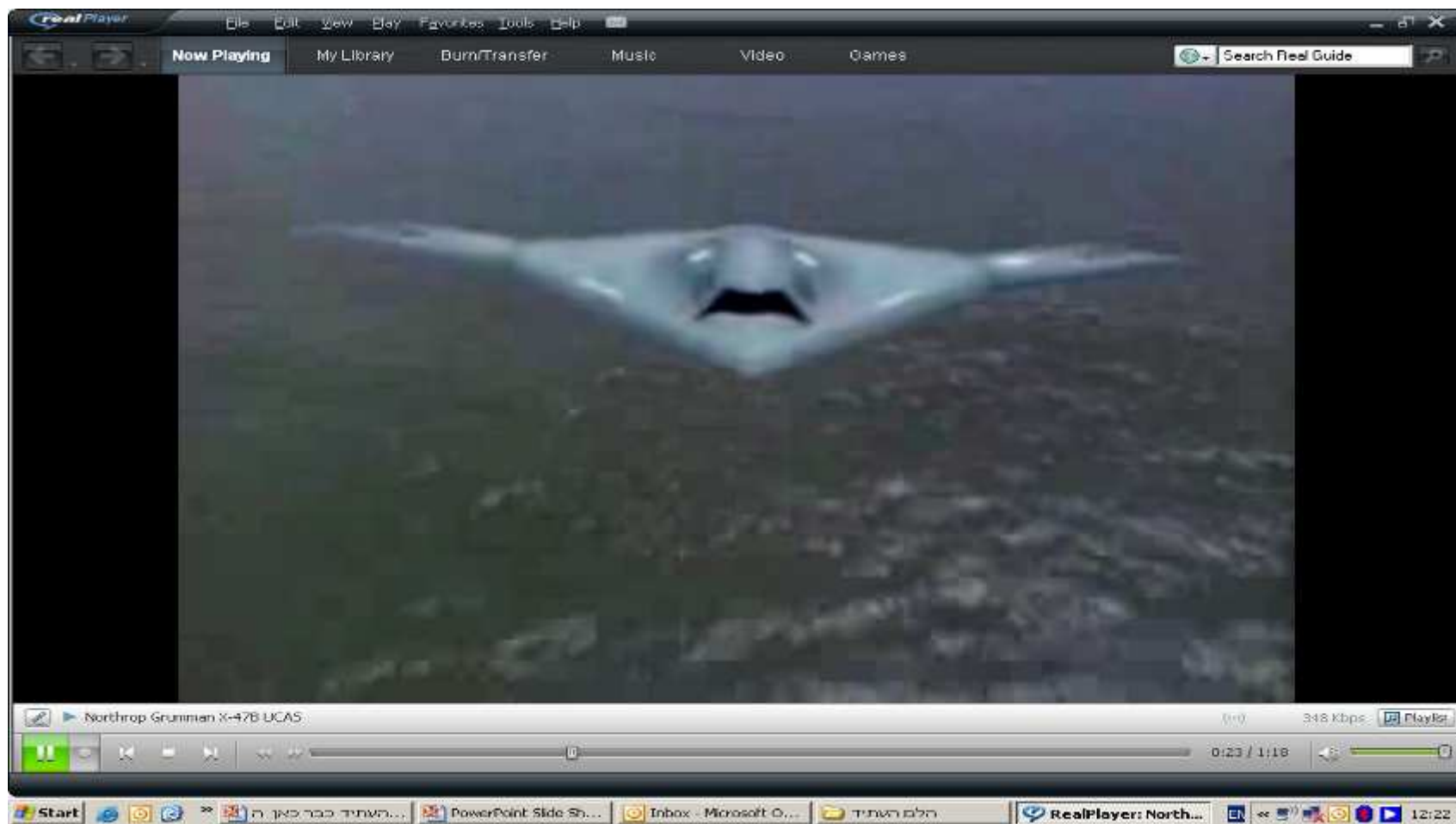


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נורתרוף-גראמן X-47

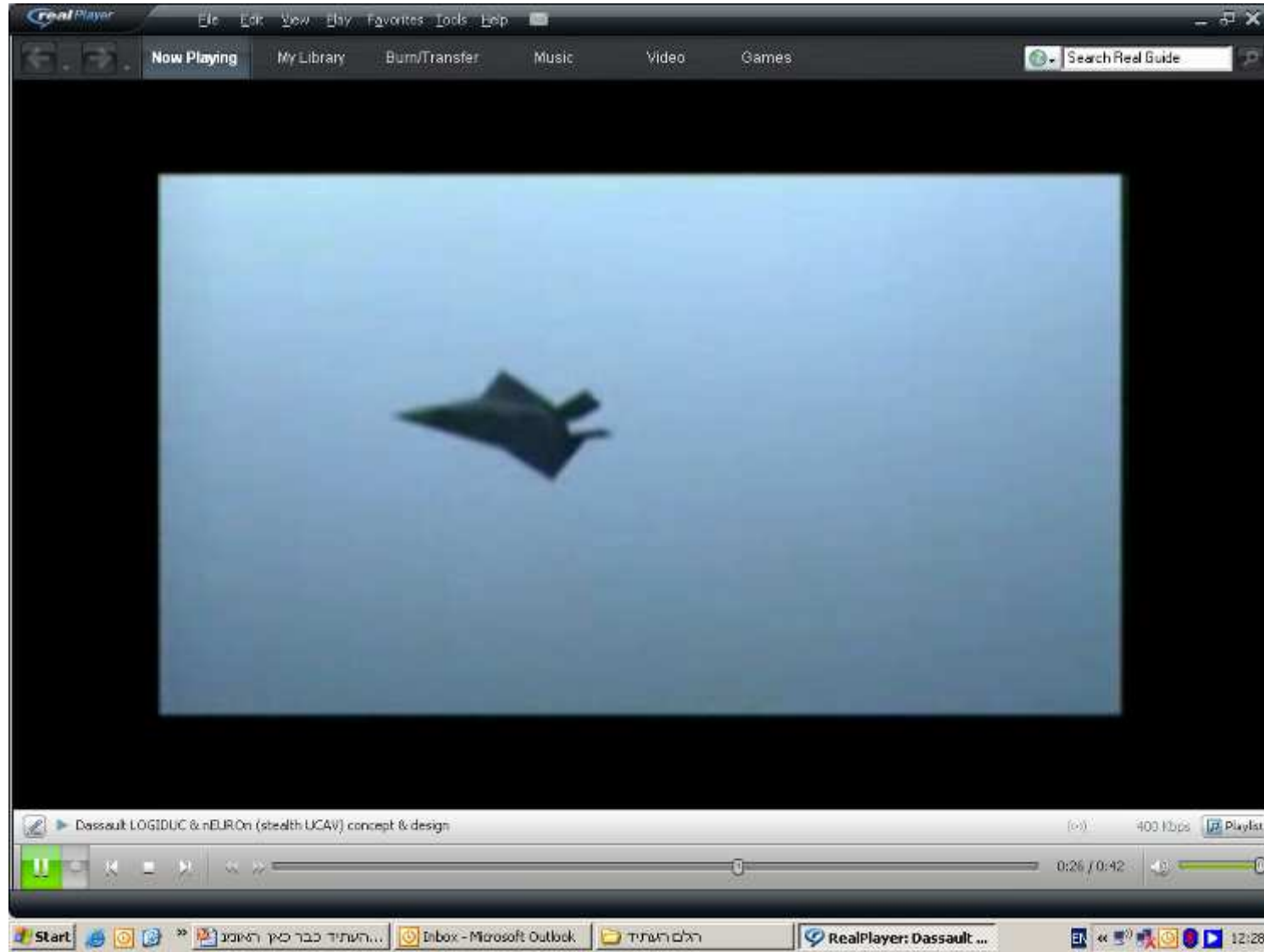


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DASSAULT NEURON STEALTH UAV



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SABRE WORRIOR



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1500 Nm Range



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מזל"ט אישי לכל מג"ד

פרויקט ניסיוני בגדודי
החי"ר: מערכת "רוכב שמים"
תספק למפקדים בשטח מודיעין
זמין וזול • ליכך שובל,

התוכנית: מזל"ט לכל מג"ד

חיל האוויר בשירות צבא היבשה • מערכת חדשה בצה"ל תאפשר למפקדי החי"ר
להפעיל מטוסים זעירים בזמן פעילות ולקבל מודיעין על זירת הלחימה בזמן אמת

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Elbit's Skylark



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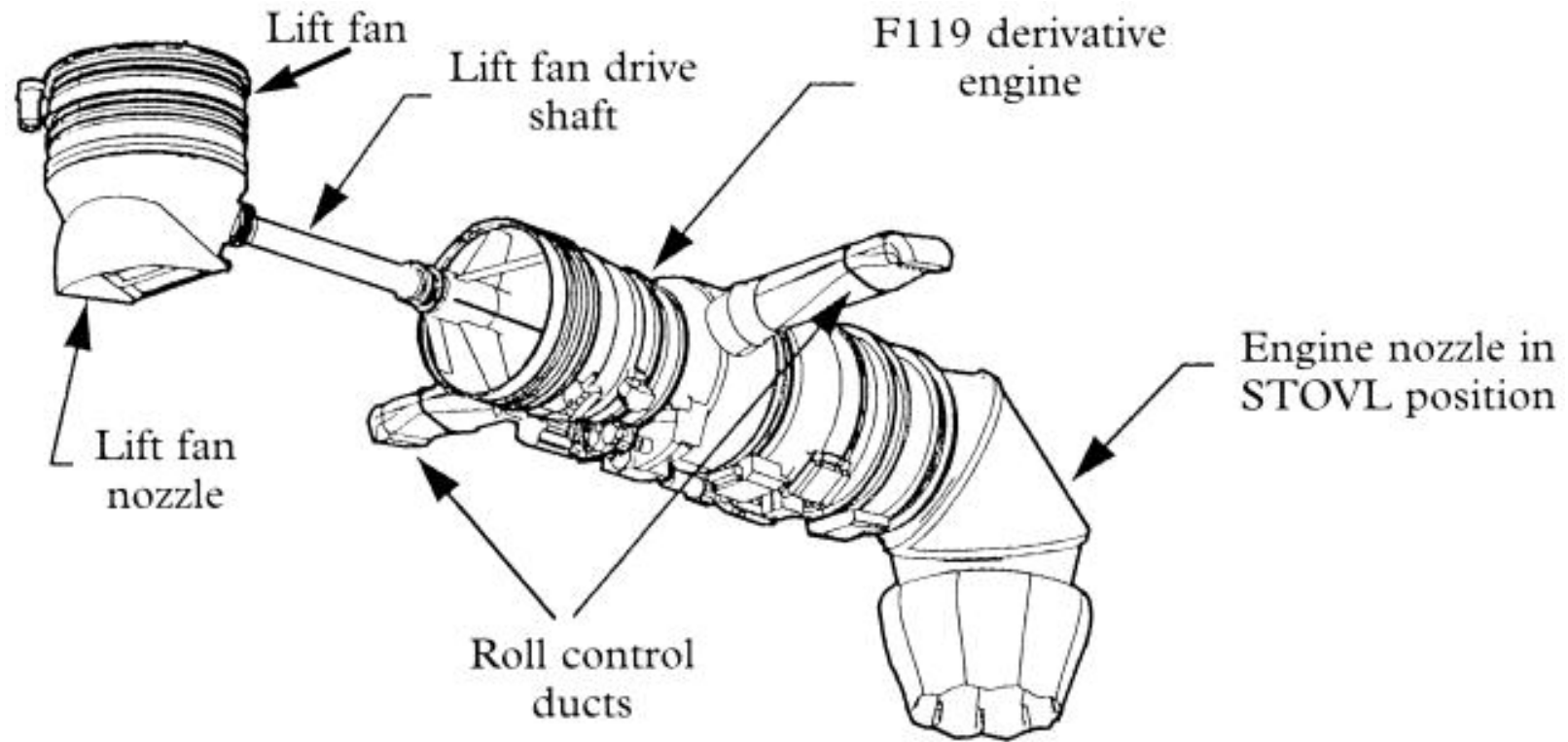
And again Going Vertical

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X-35B PROPULSION SYSTEM P&W JSF119-SE611S



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F-35C CUTAWAY



VECTORED ENGINE THRUST

LIFTING FAN

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JSF X -35 VTOL



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- ועוד ועוד בתחום ה -

חומרים
תהליכים
הנעה חדשה
מיחשוב
מיזעור
תקשורת

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ADAPTIVE MATERIALS



Adaptive Control



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The future of Stealth

Adaptive terrain match skin

Imagine you can electronically change the color of a given surface in such a way it can match the terrain below it.

Recent breakthroughs in chemical polymer technology have made it possible to create polymer ("electrochromic polymer") color displays.



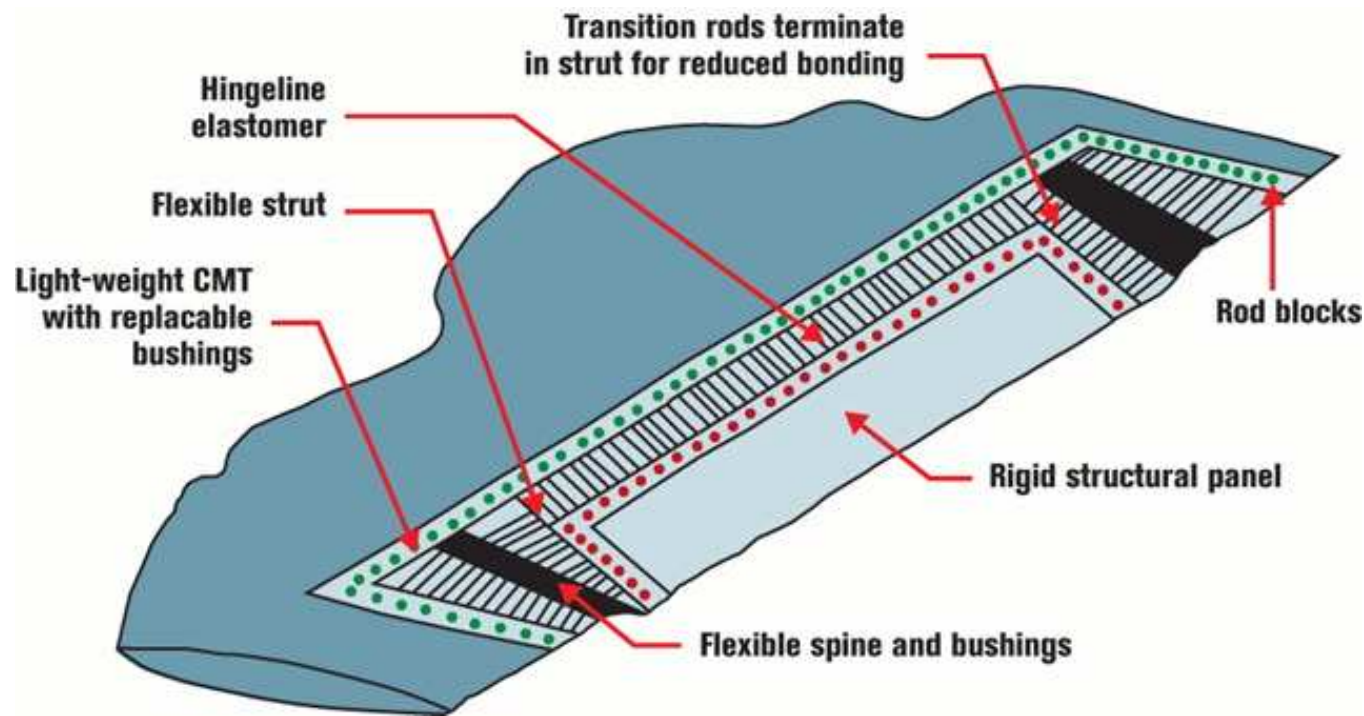
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**Use of flexible elastomer skins for
weapon bay doors,
control surfaces and variable inlets.**

*Boeing has patented a design for a gapless control surface
with flexible hinge and end covers,
Gaps can create radar hot-spots for a stealthy aircraft.*

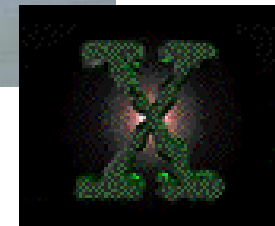


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The Ultimate Stealthy Aircraft



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Toward a Bold New Era in Aviation

NASA Aeronautics Blueprint



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The Blueprint has four major elements:

Economic Growth

- Productivity
- Global Competition
- Fullest Commercial

National Security

- Air Superiority
- Global Mobility

Quality of Life

- Freedom of Movement
- General Welfare



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שימוש בטכניקות שיבוש והטעייה מתקדמות



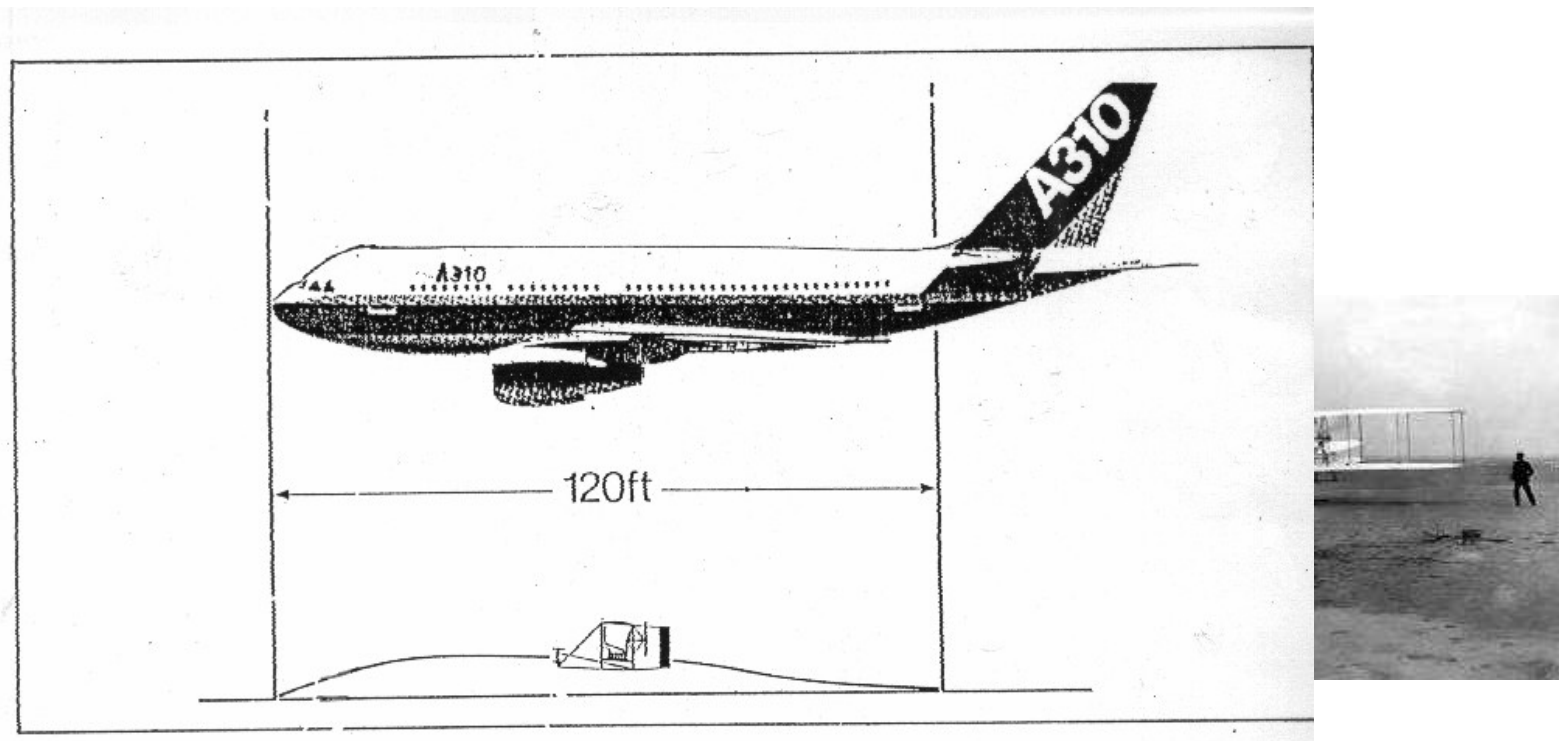
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Just a Matter of Perspective:

*The Dawn of The Era of Powered Flight
Wright Brothers Flyer – December 17 1903 At 10:35*



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QUESTIONS?

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