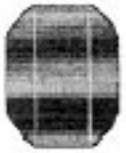
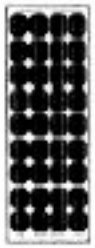
การออกแบบผลิตภัณฑ์ระบบเซลล์แสงอาทิตย์

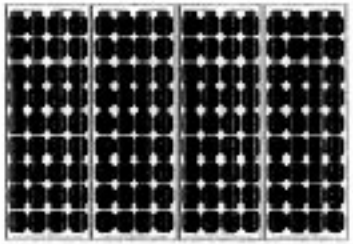
Terms used



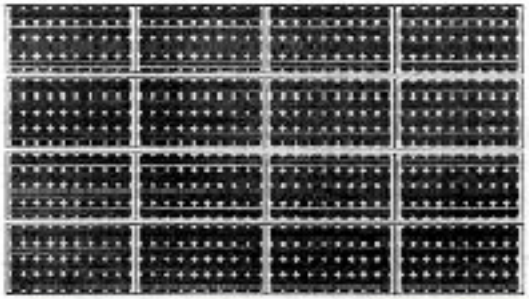
Cell – basic building block in factory



Module – smallest unit that can do real-world work, building block in the field

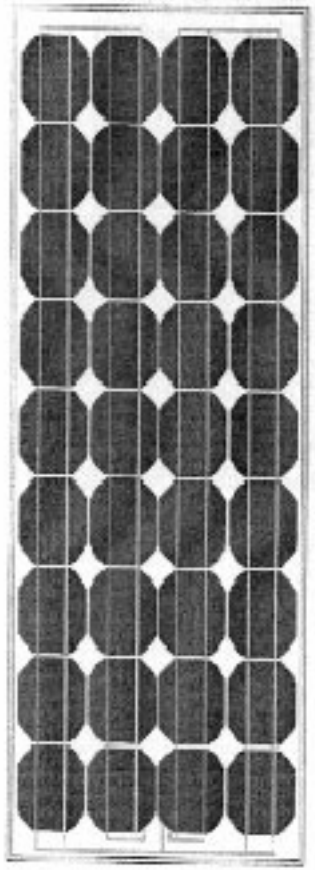


Panel – physically connected modules on a structure

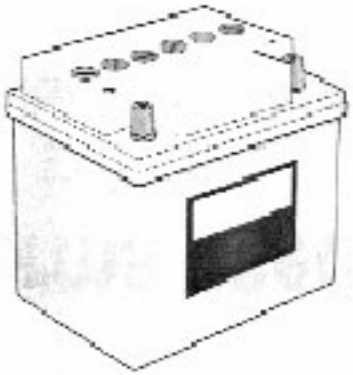


Array – all solar generators in one installation

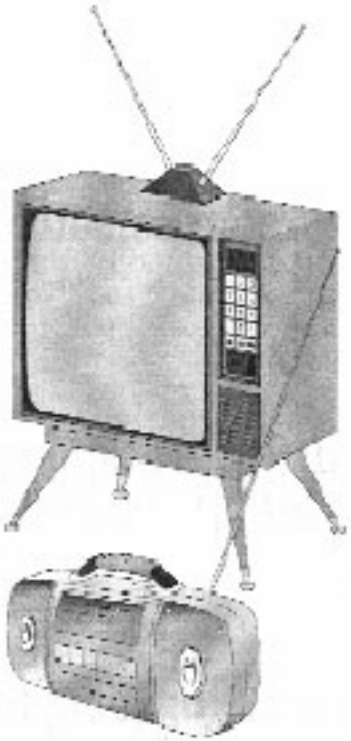
Battery and module work together



Daytime
Charging



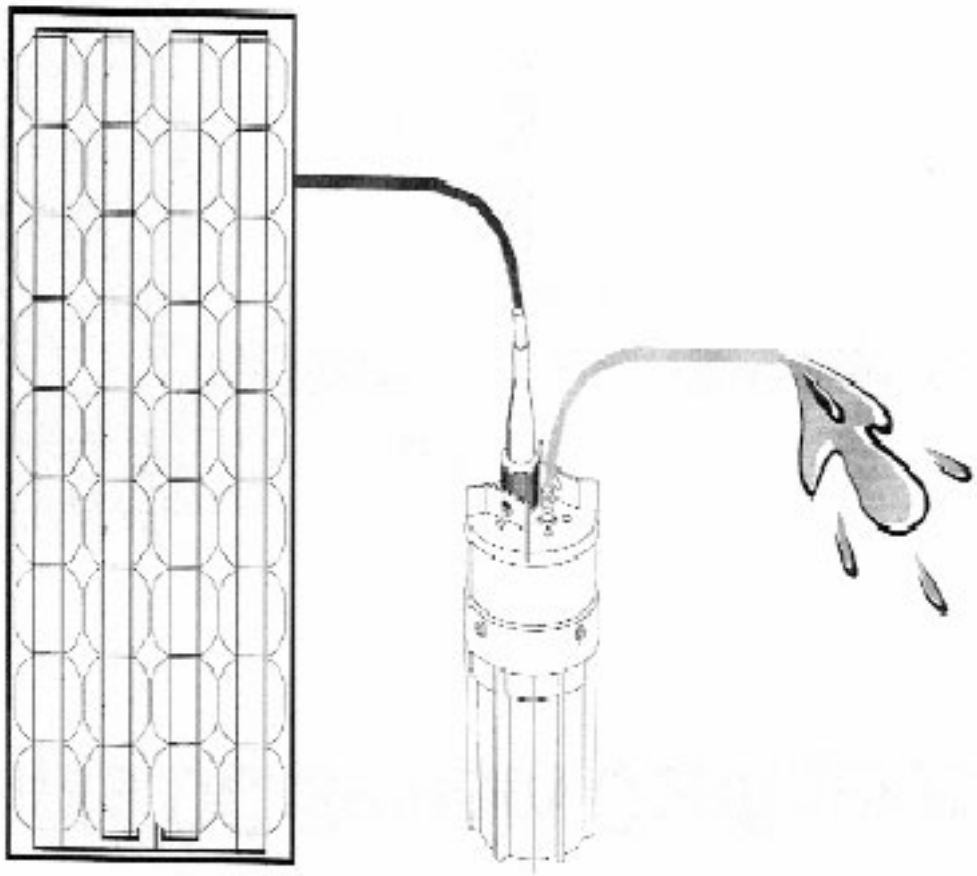
Usage
Anytime



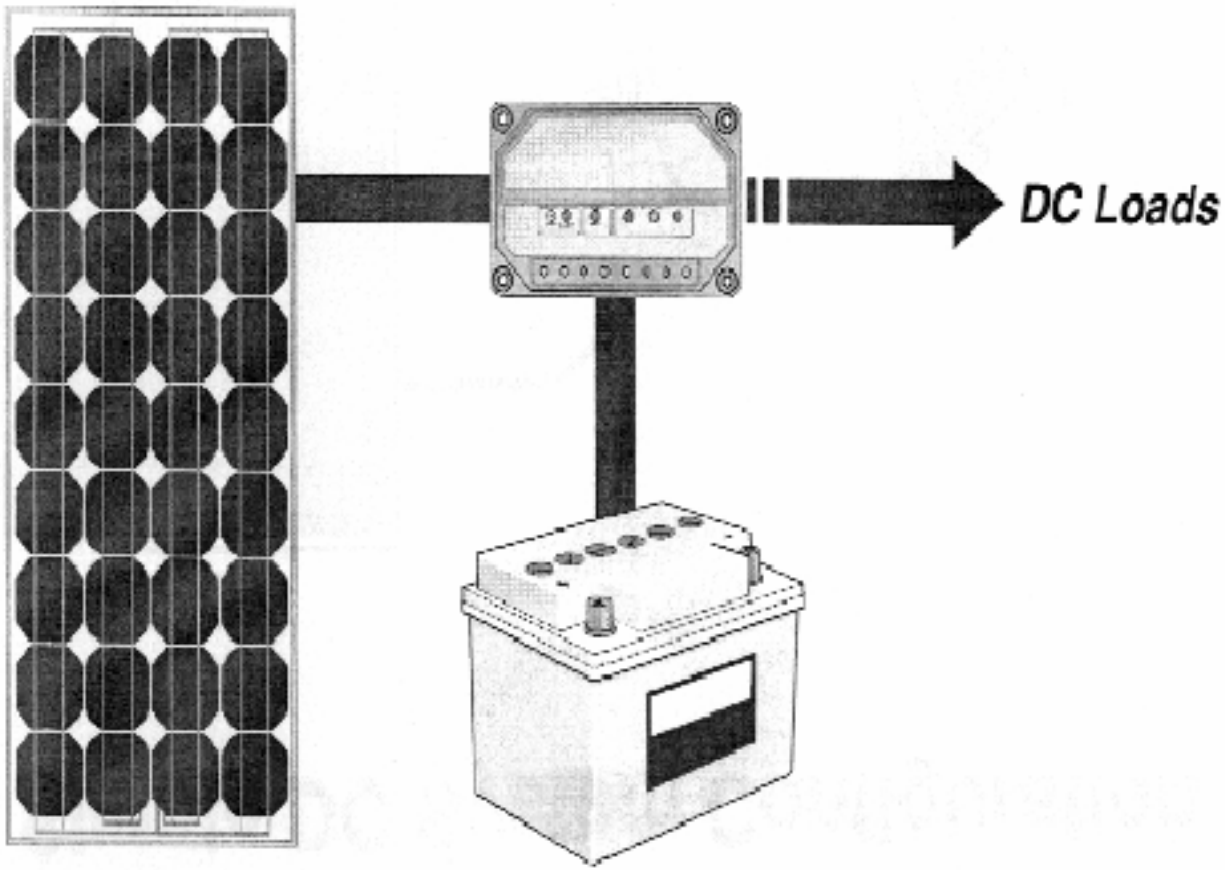
Application Flexibility

1 Watt	⟷	Megawatts
Near existing utility power	⟷	Remote
Daytime only	⟷	Any weather, any time
Purely PV	⟷	Hybrid System
Centralized generation	⟷	Distributed generation

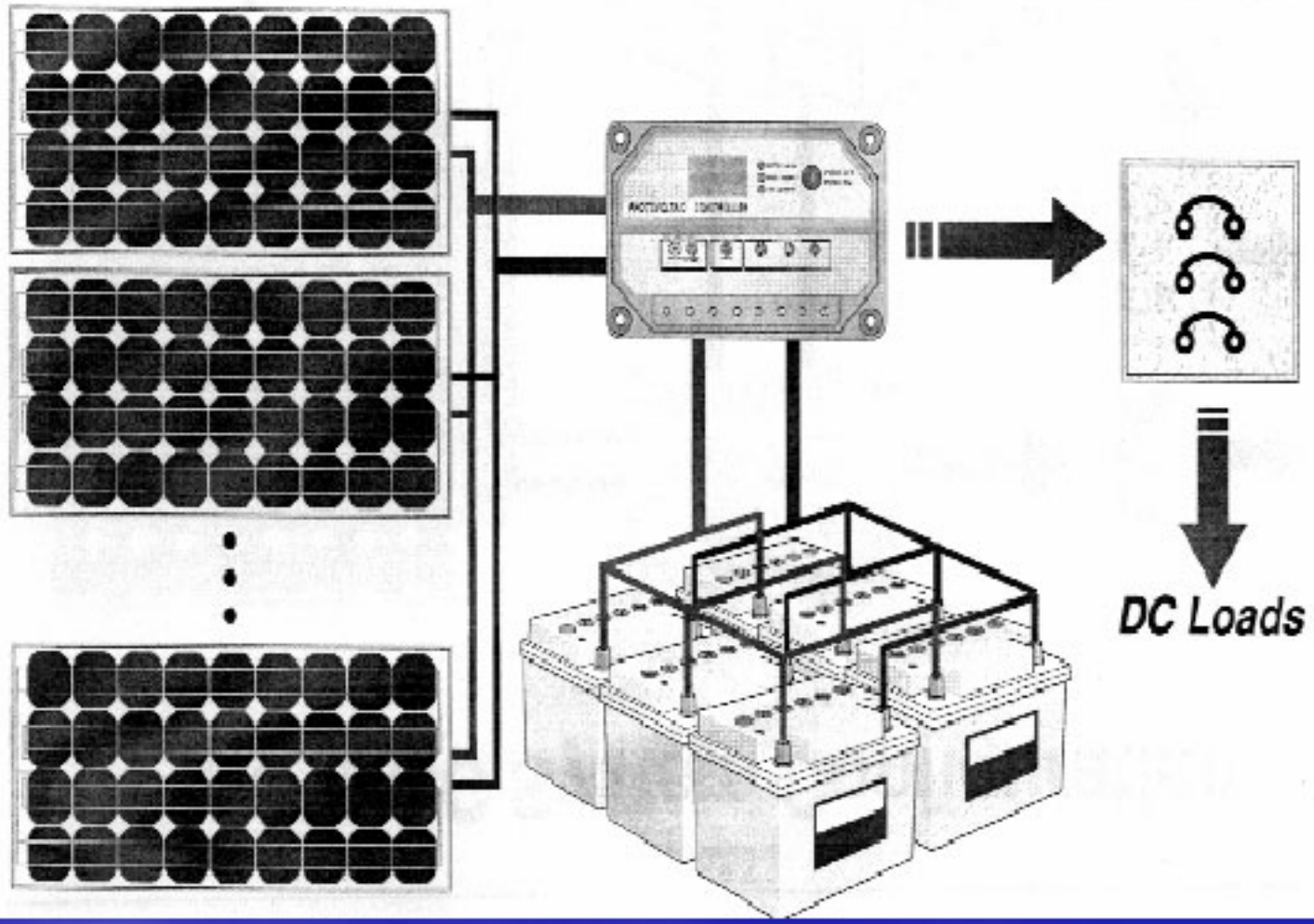
Simple DC System Configuration



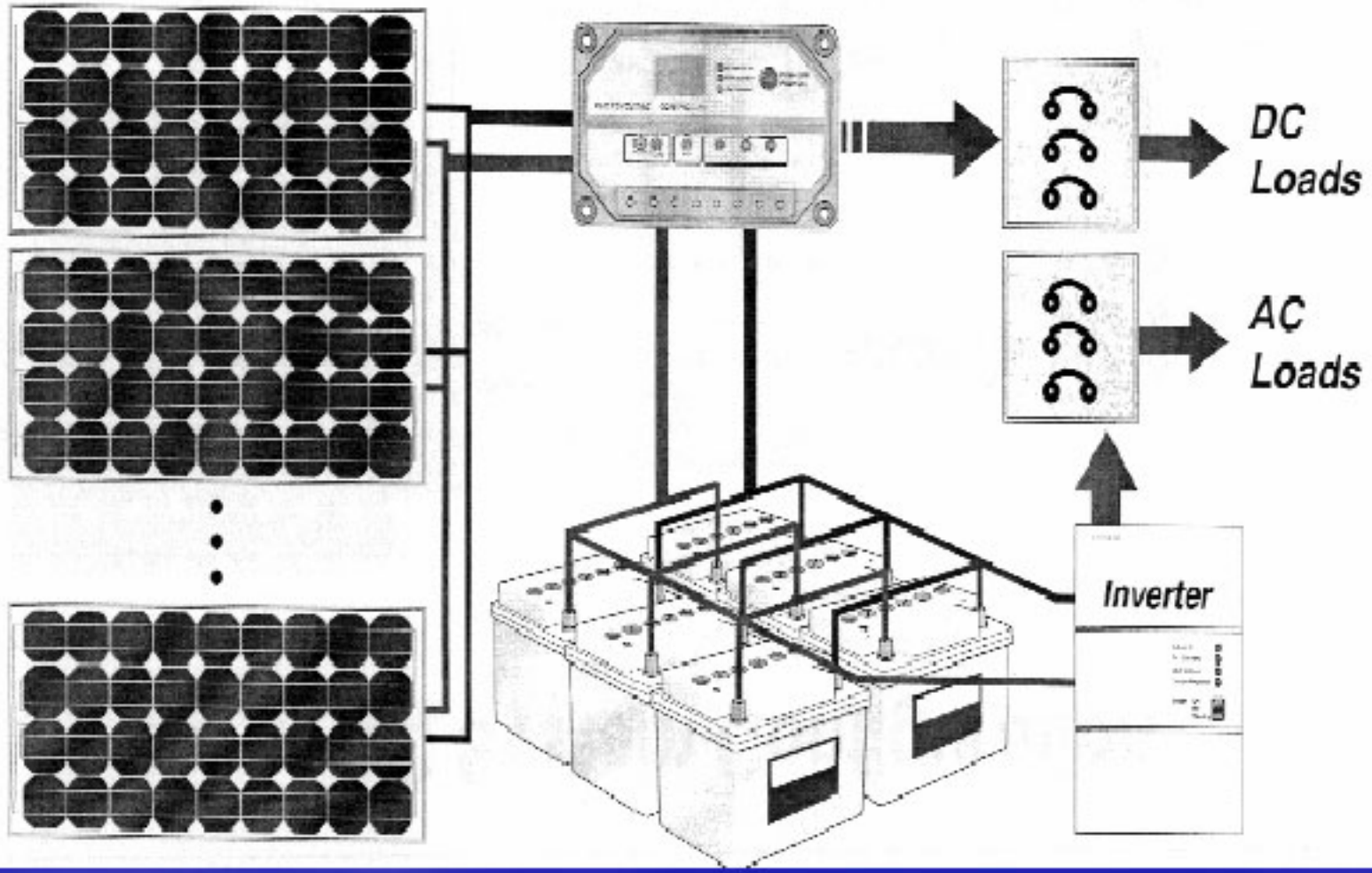
Simple DC System Configuration



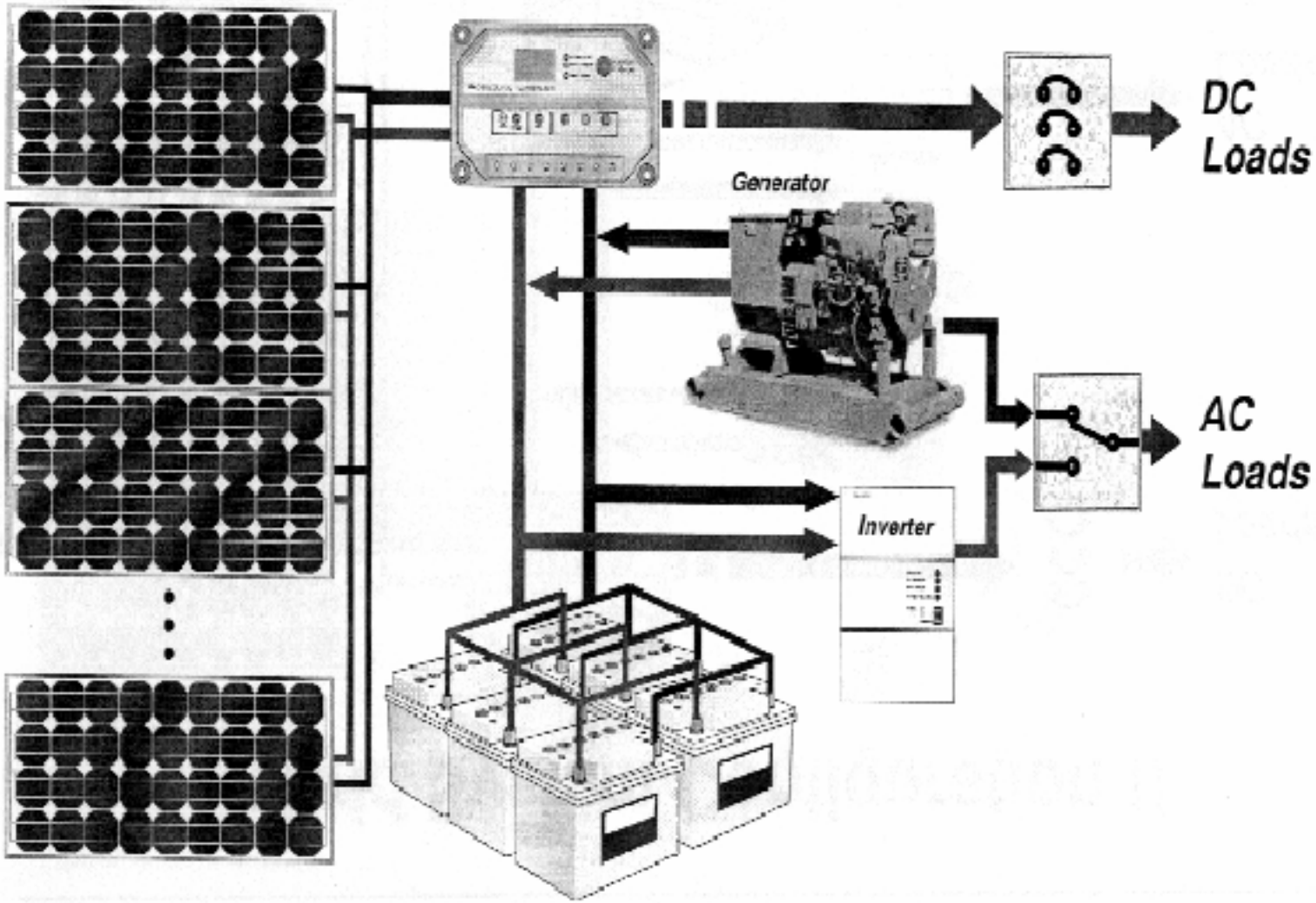
Large DC System Configuration



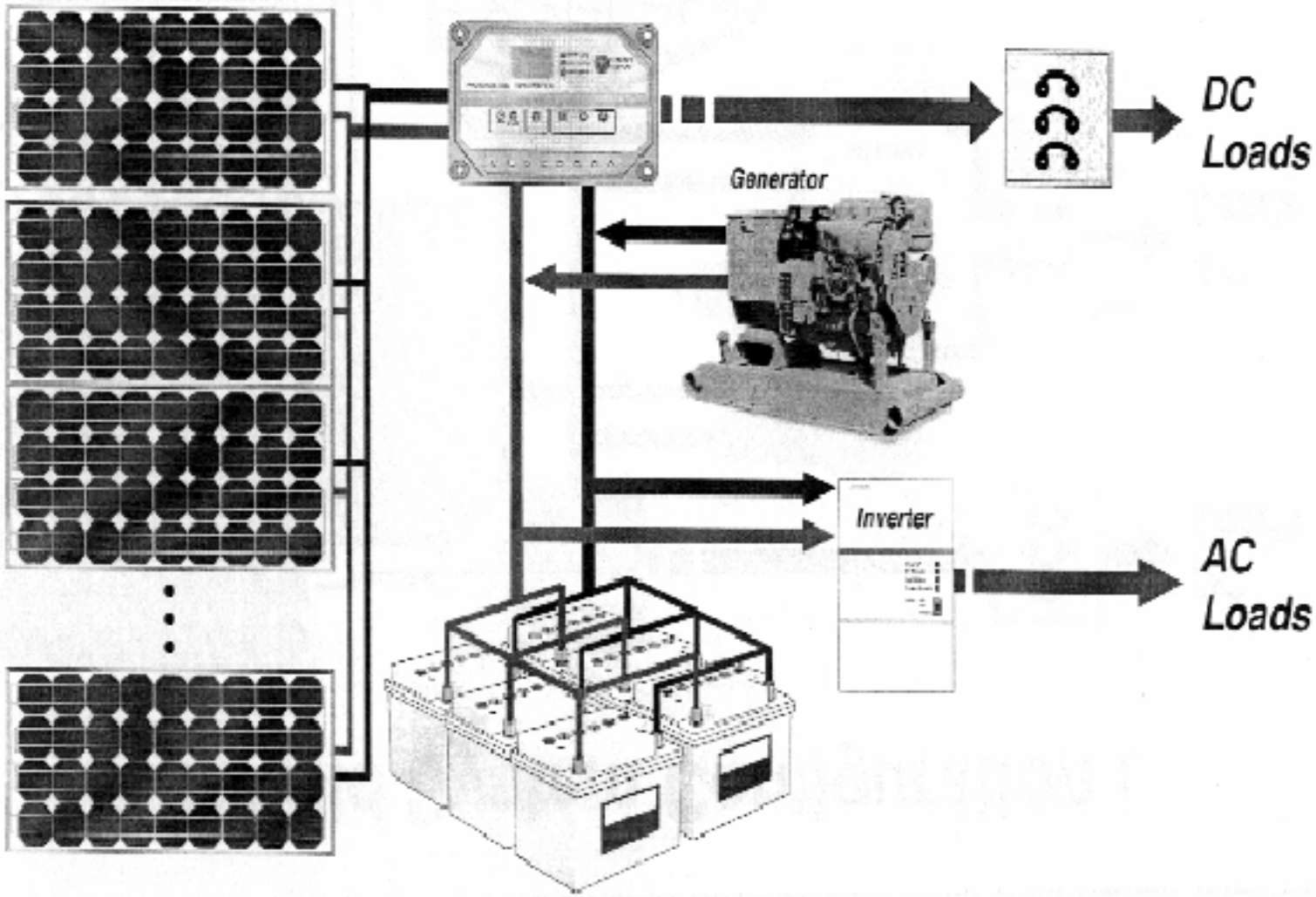
AC & DC System Configuration



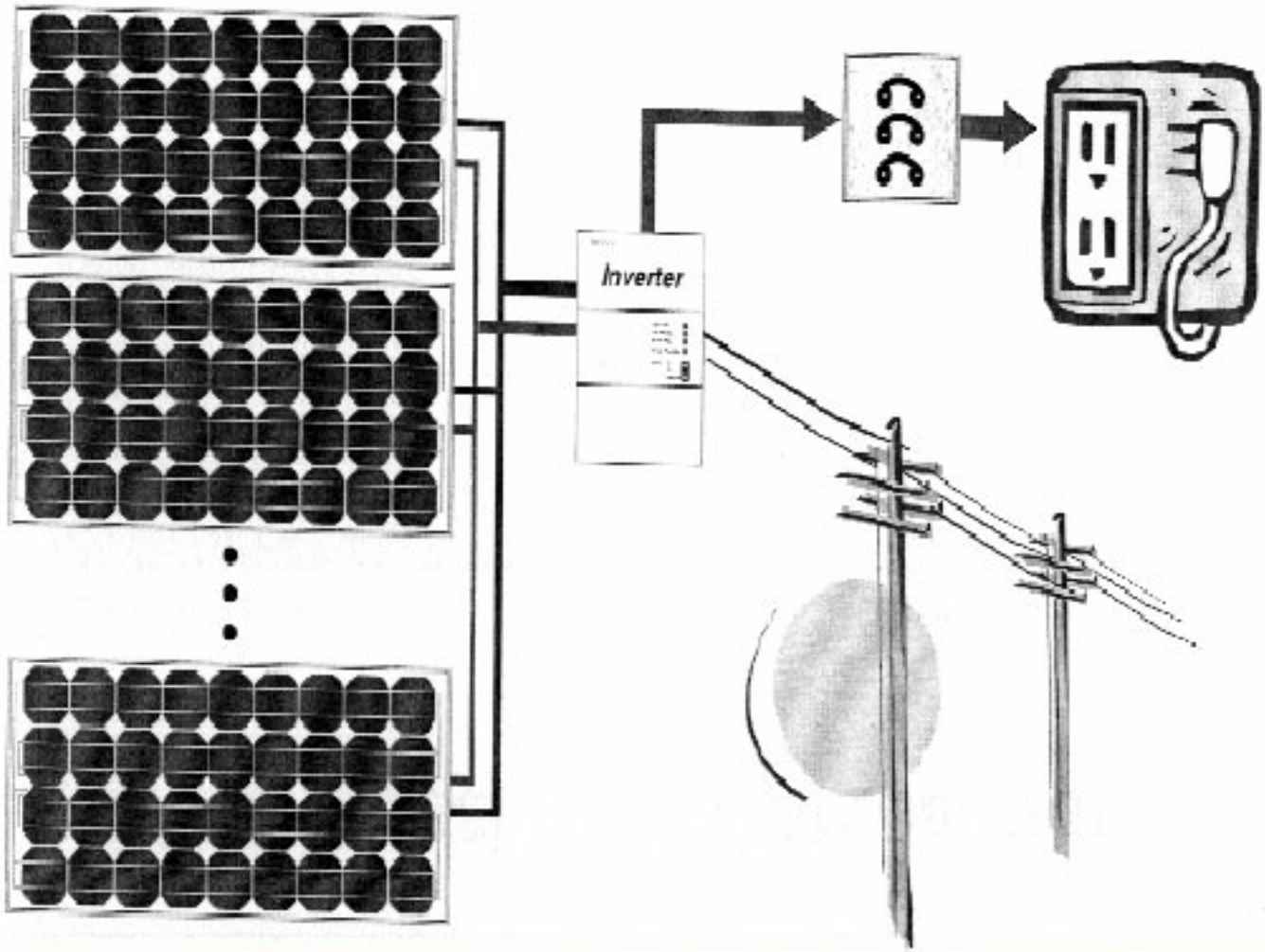
Hybrid System Configuration I



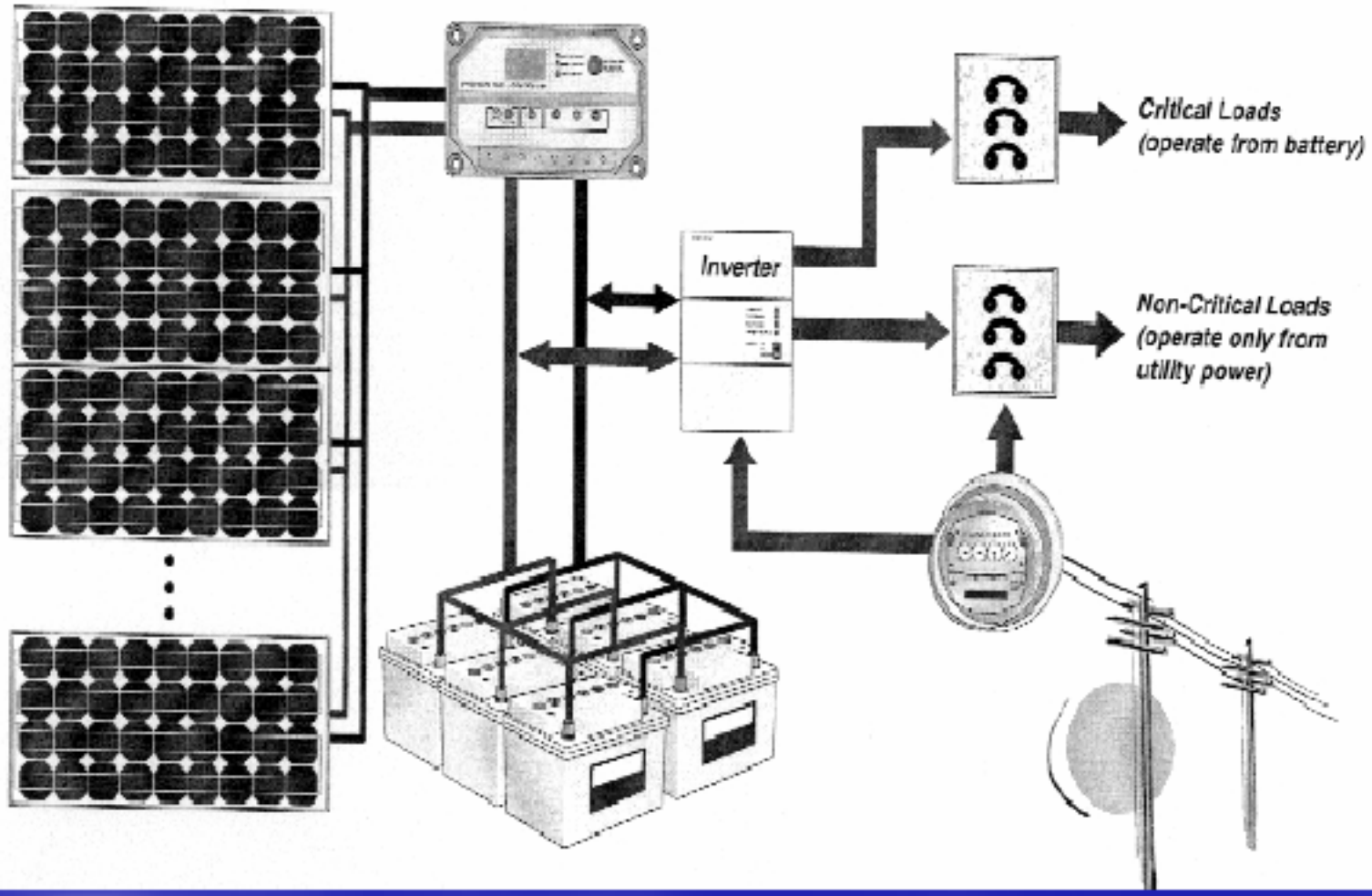
Hybrid System Configuration II



Utility Connected Configuration



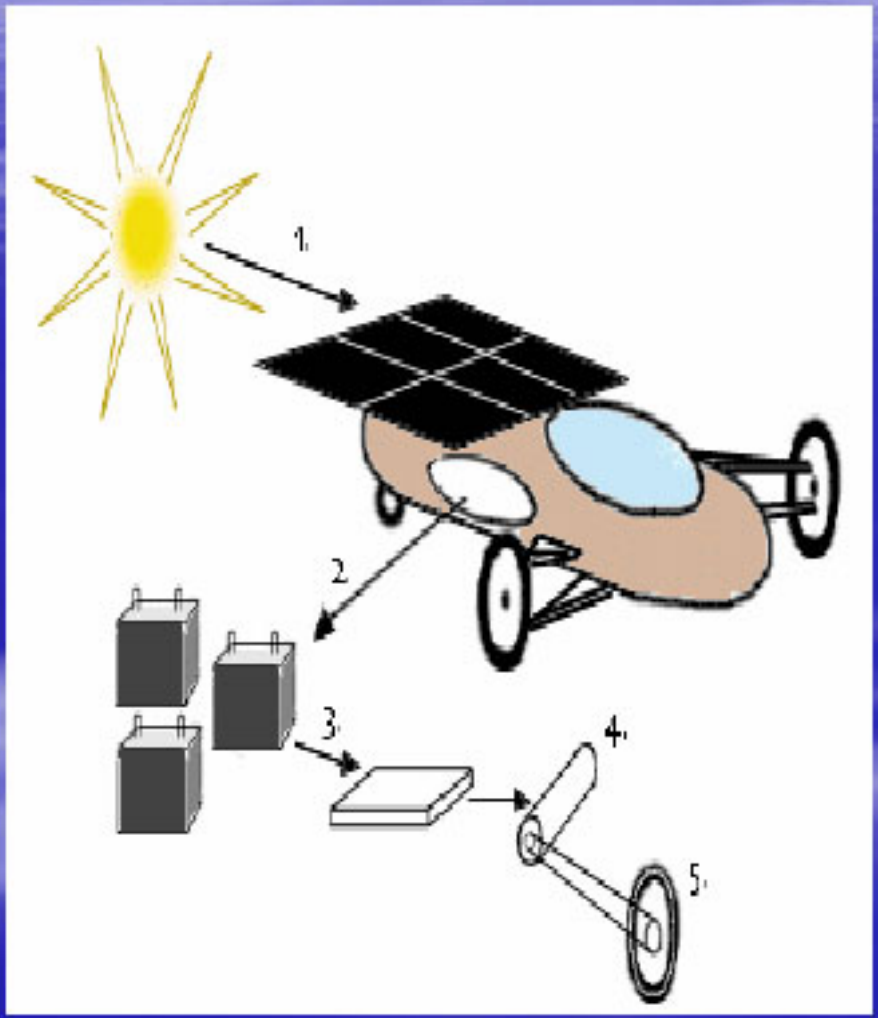
Bi-Directional Utility Configuration



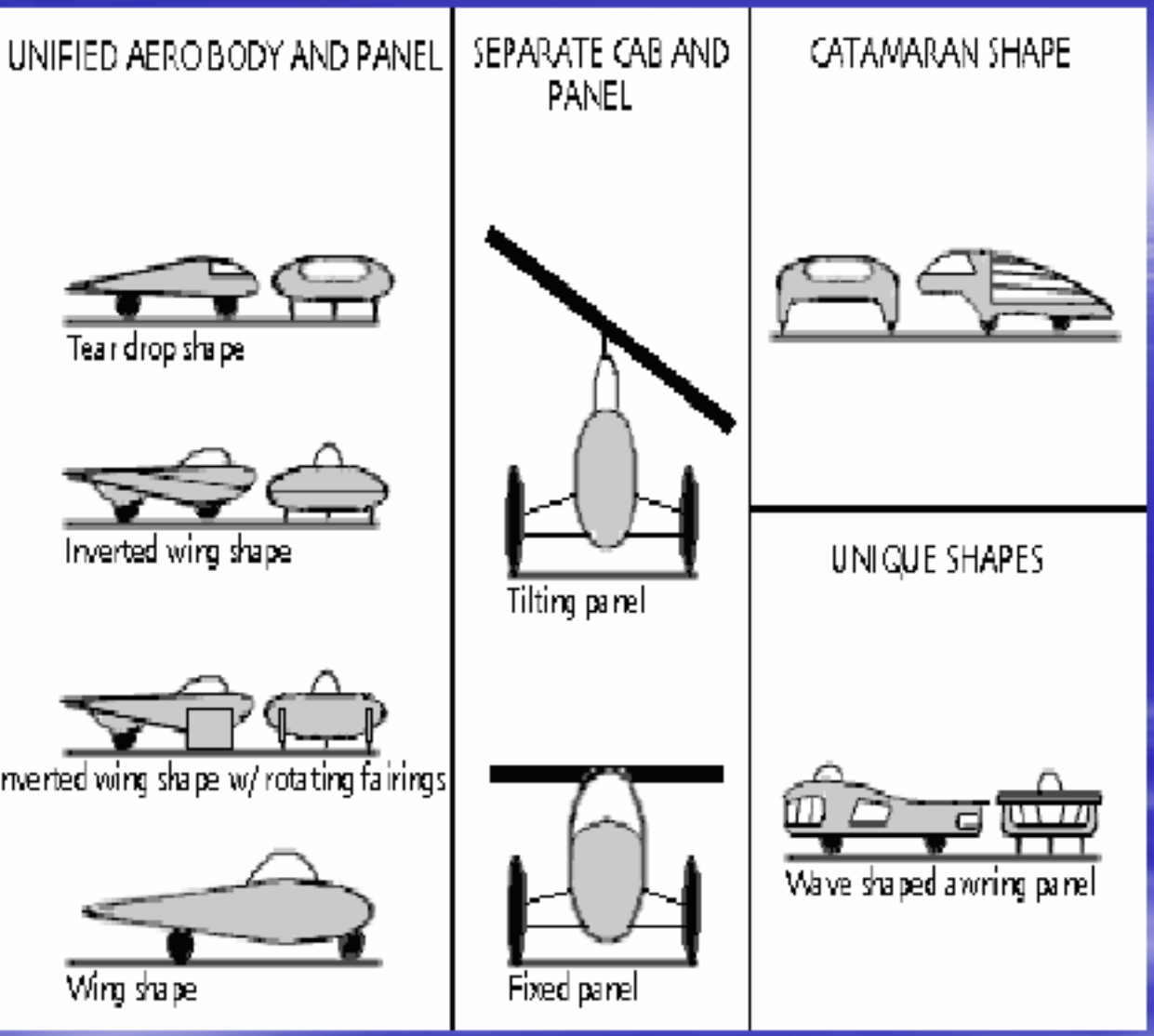
Solar Innovative Contest 3

อ.ธวัชชัย สุวรรณคำ

รถไฟฟ้าระบบเซลล์แสงอาทิตย์



1. พลังงานแสงอาทิตย์แปลงเป็นไฟฟ้าโดยตรงด้วยระบบเซลล์แสงอาทิตย์
2. พลังงานไฟฟ้าเก็บในระบบแบตเตอรี พลังงานไฟฟ้าจะถูกส่งตรงไฟยังมอเตอร์เมื่อรถวิ่ง
3. อุปกรณ์ควบคุมมอเตอร์ใหม่ๆ มีการควบคุมที่เรียบและประสิทธิภาพสูง และการควบคุมทำได้ด้วยคันเร่งที่เท้า
4. เทคโนโลยีมอเตอร์สมัยใหม่ ใช้สารแม่เหล็กที่เป็นสารประกอบออกไซด์ และการออกแบบที่ไม่ใช้แปลงถ่าน มอเตอร์ขนาด 5 แรงม้า มีน้ำหนักน้อยกว่า 5 กิโลกรัม
5. การขับเคลื่อนล้อในรถสมัยใหม่ไม่ต้องใช้เกียร์ การเปลี่ยนเกียร์ใช้ระบบอิเล็กทรอนิกส์ที่อยู่ในมอเตอร์

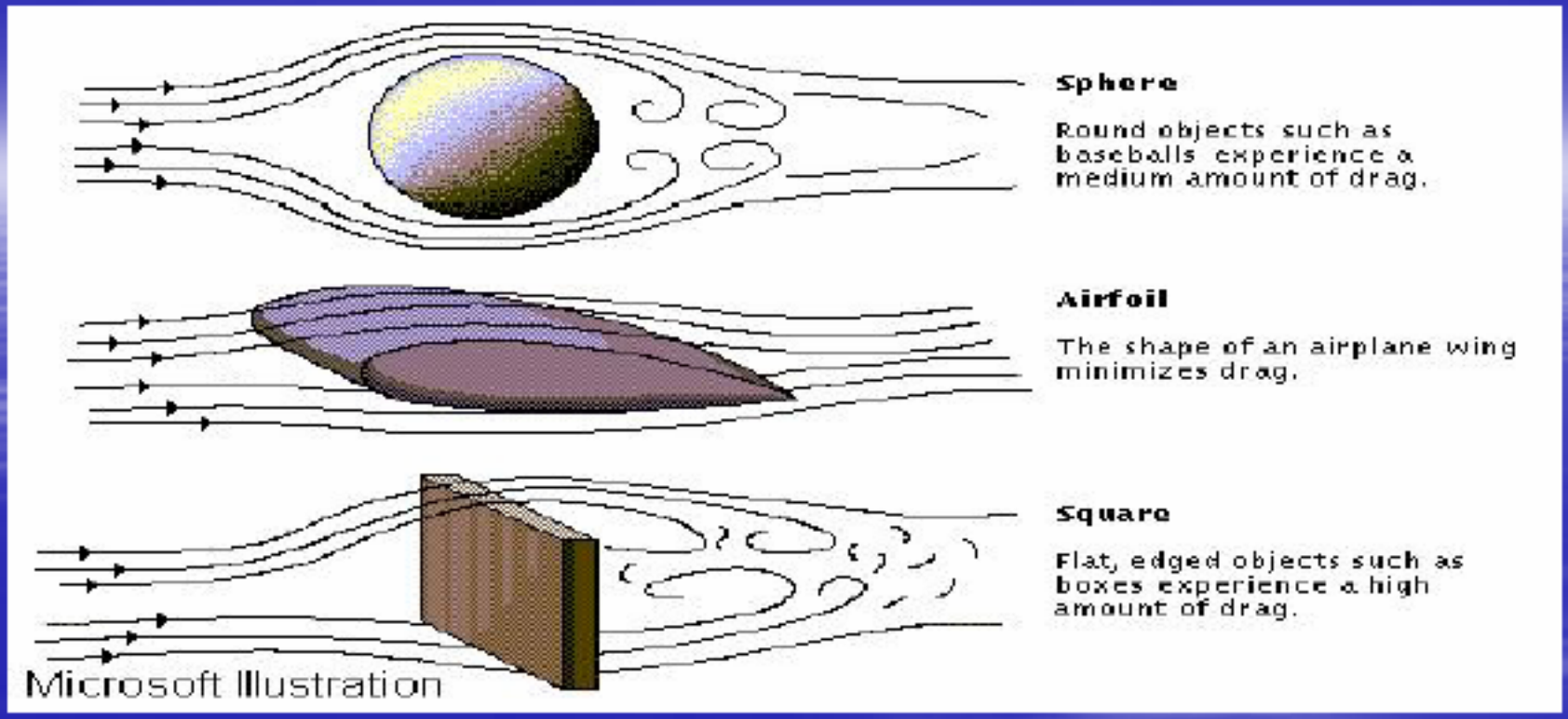


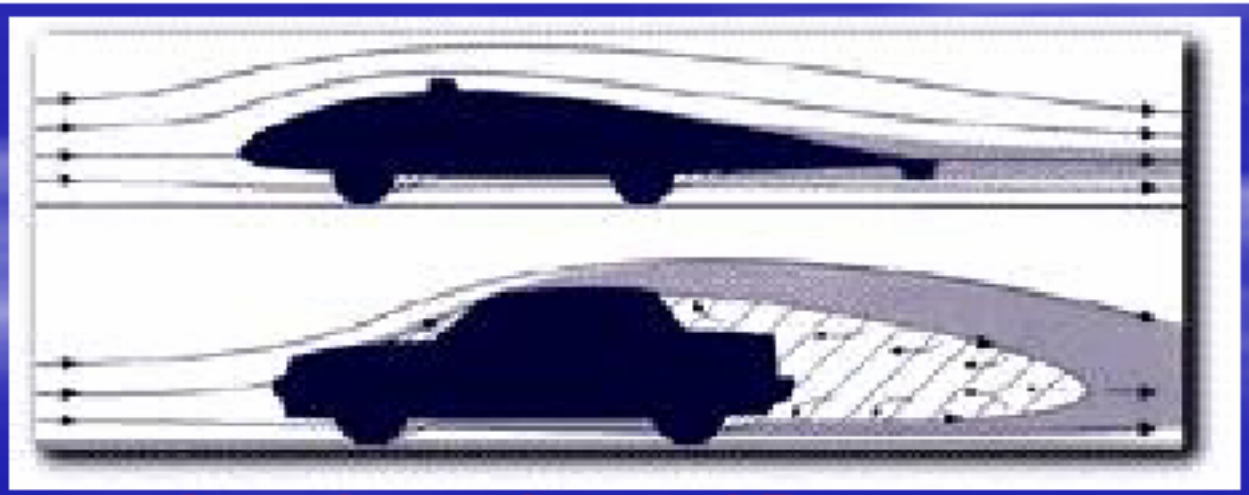
1 - การออกแบบรถต้องออกแบบให้มีพื้นที่รับแสงมากที่สุด เพื่อให้รถได้รับพลังงานแสงอาทิตย์สูงสุด

2 - การออกแบบตัวรถต้องมีลักษณะแอร์โรไดนามิกส์ เพื่อลดแรงฉุดที่รถได้รับขณะวิ่ง

3 - ผิวของผนังตัวรถต้องเรียบ เพื่อลดแรงเสียดทานของอากาศ

การออกแบบลักษณะรูปทรงรถไฟฟ้าด้วยเซลล์แสงอาทิตย์





Aerodynamics and Drag:

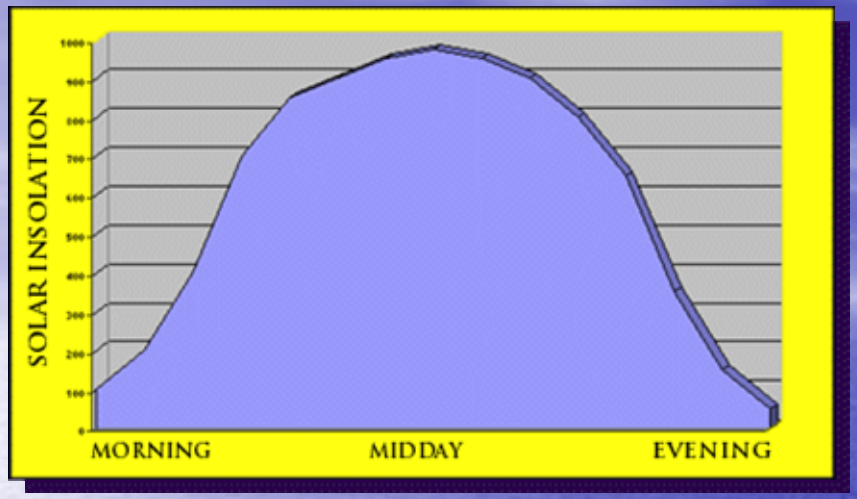


Figure 1:
Typical solar insolation for a sunny day.

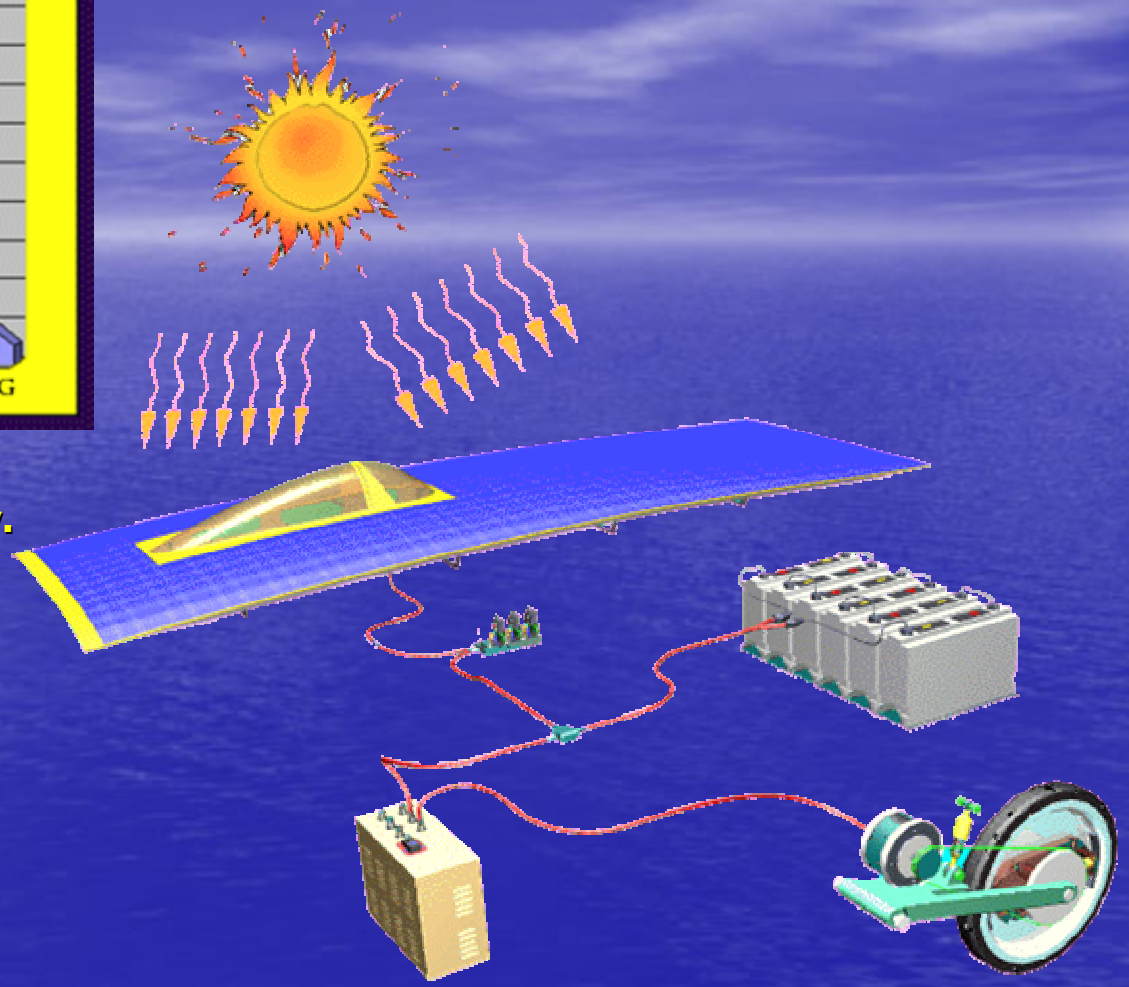
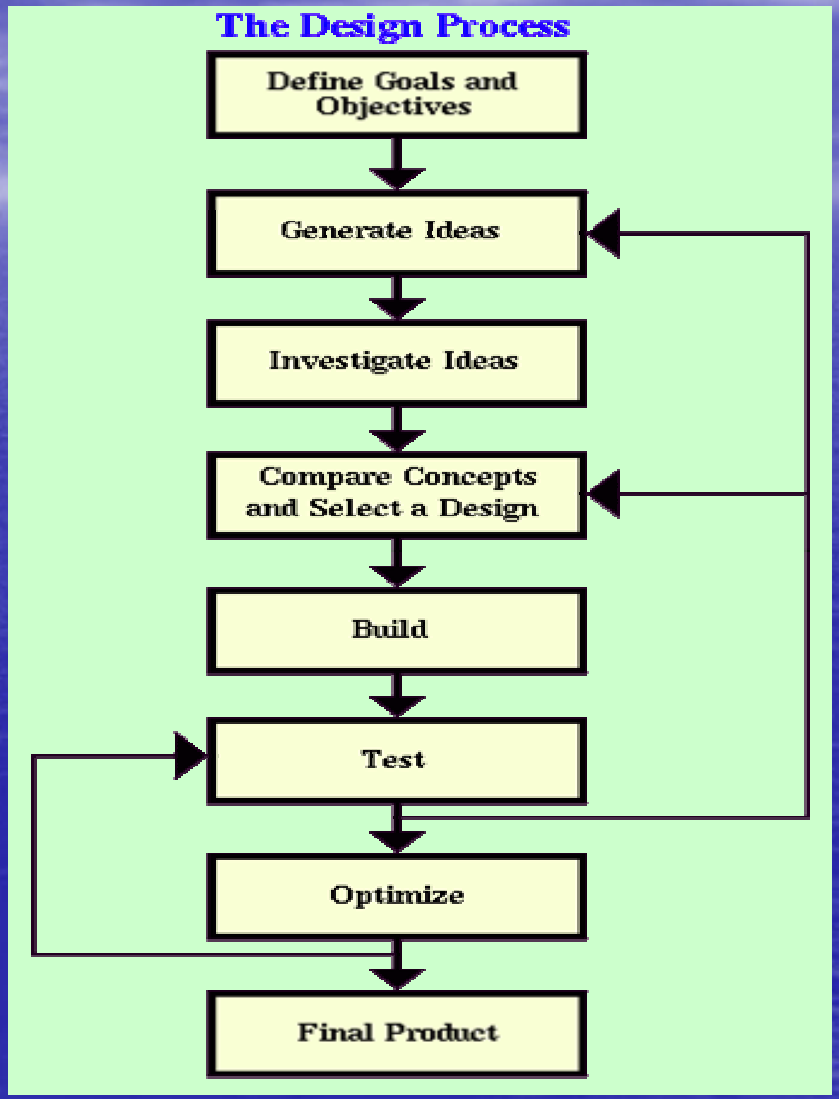


Figure 2: Energy flow diagram for a solar car.

ข้อพิจารณาในการออกแบบ

- ราคา
- ประสิทธิภาพ
- อะไหล่
- กฎการแข่งขัน
- ความเข้ากันได้ของระบบ
- ระยะเวลาที่จำกัด
- น้ำหนัก



Key to the success is not only to have best systems, but also excellent integrations.

- **All-Purpose Solar Car Books**
- GM Sunraycer Case History/M-101
- Racing With the Sun : The 1990 World Solar Challenge
- Racing With the Sun II : The 1993 World Solar Challenge
- Speed of Light : The 1996 World Solar Challenge
- Alternate site: http://www.pv.unsw.edu.au/speedoflight.html
- Sunraycer
- Sunracing
- **Mechanical Books**
- Fundamentals of Vehicle Dynamics (R114)
- Machinery's Handbook : A Reference Book for the Mechanical Engineer, Designer, Manufacturing Engineer, Draftsman, Toolmaker, etc.
- Machinery's Handbook (25th Ed)
- Machinery's Handbook CD-ROM Edition
- Machinery's Handbook Guide to the use of tables and formulas
- Race Car Engineering and Mechanics
- Statics and Mechanics of Materials
- Race Car Vehicle Dynamics (R146)
- **Aerodynamics Books**
- Aerodynamics for Racing and Performance Cars
- Theory of Wing Sections
- Foundations of Aerodynamics : Bases of Aerodynamic Design
- Low-Speed Wind Tunnel Testing
- Race Car Aerodynamics : Designing for Speed
- **Electrical Books**
- Solar Cell Array Design Handbook : The Principles and Technology of Photovoltaic Energy Conversion
- Practical Electrical Wiring
- **Fundraising Books**
- Conducting a Successful Capital Campaign: A Comprehensive Fundraising Guide for Nonprofit Organizations (Management Series/Higher Education Series)
- Fundraising : Hands-On Tactics for Nonprofit Groups
- Fund-Raising Fundamentals : A Guide to Annual Giving for Professionals and Volunteers (Nonprofit Law, Finance, and Management)
- How to Write Successful Fundraising Letters
- Keep the Money Coming : A Step-By-Step Strategic Guide to Annual Fundraising
- Selling the Dream : How to Promote Your Product, Company, or Ideas-And Make a Difference-Using Everyday Evangelism
- The Athlete's Guide to Sponsorship : How to Find an Individual, Team or Event Sponsor

- **Racing Books**
- Drive to Win : The Essential Guide to Race Driving
- Prepare to Win
- Sports Car and Competition Driving
- Think to Win : The New Approach to Fast Driving
- Tune to Win
- Winning : A Race Drivers Handbook
- **Logistics Books**
- Eyewitness Travel Guides : Australia (Eyewitness Travel Guides)
- Fodor's '99 Australia (Fodor's Gold Guides)
- Outback Australia Handbook : Including the Red Centre, Kakadu National Park, and the Kimberley (2nd Edition)
- The Unofficial Guide to Walt Disney World 1999 (Serial)
- Birnbaum's Walt Disney World 1999 : Expert Advice from the Inside Source (Serial)
- The Everything Guide to Walt Disney World Universal Studios : And Greater Orlando : Hotels, Restaurants, Major Attractins, and More (Everything)
- The Insiders' Guide(r) to Atlanta
- Fodor's Pocket Atlanta (2nd Ed)
- Fodors Citypack Atlanta (2nd Ed)
- **Management Books**
- Fundamentals of Project Management (The Worksmart)
- How to Drive Your Competition Crazy: Creating Disruption for Fun and Profit
- Leadership Is an Art
- Project Management: A Systems Approach to Planning, Scheduling, and Controlling
- Rules for Revolutionaries: The Capitalist Manifesto for Creating New Products and Services
- The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change
- The Complete Idiot's Guide to Project Management (Complete Idiot's Guide)
- **Entertainment**
- Race the Sun (movie)
- Queen Greatest Hits (Hollywood)

Build a solar boat and explore the world of sustainable energy

Solar Innovative Contest 3

อ.ธวัชชัย สุวรรณคำ

Solar Cell

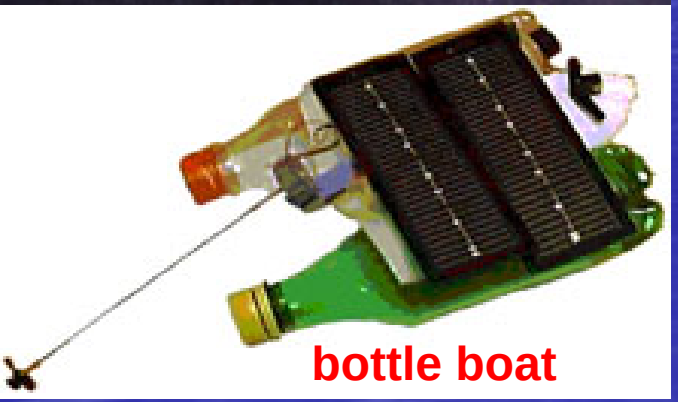
3-blade propeller, diameter 30mm

4-blade propeller, diameter 58mm

3-blade propeller, diameter 25mm

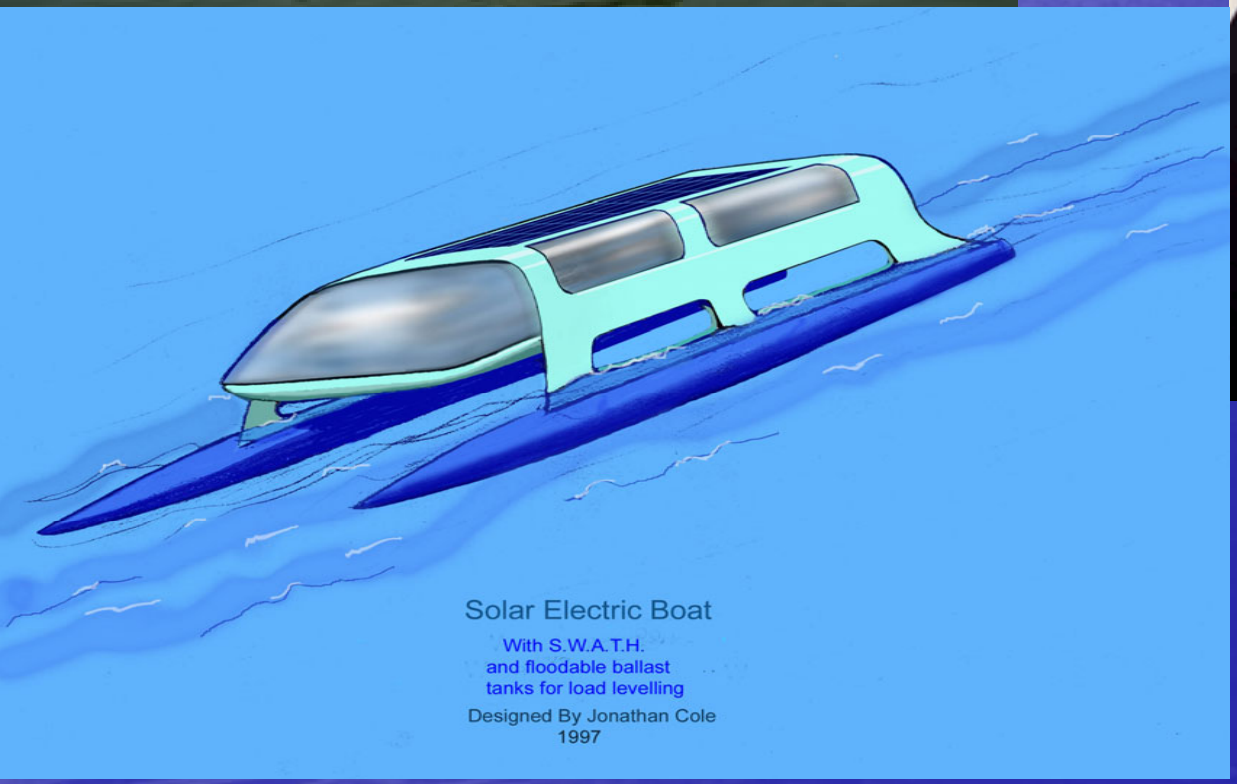
solar motor in self-adhesive mount

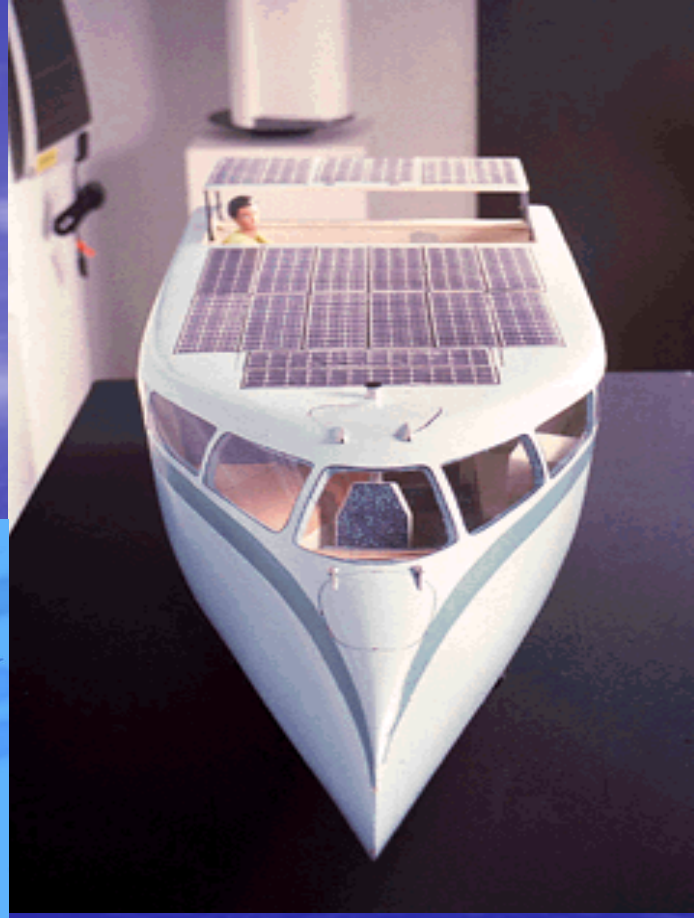
direct 1:1 drive turning 25mm propeller



bottle boat

3:1 reduction drive turning 58mm propeller





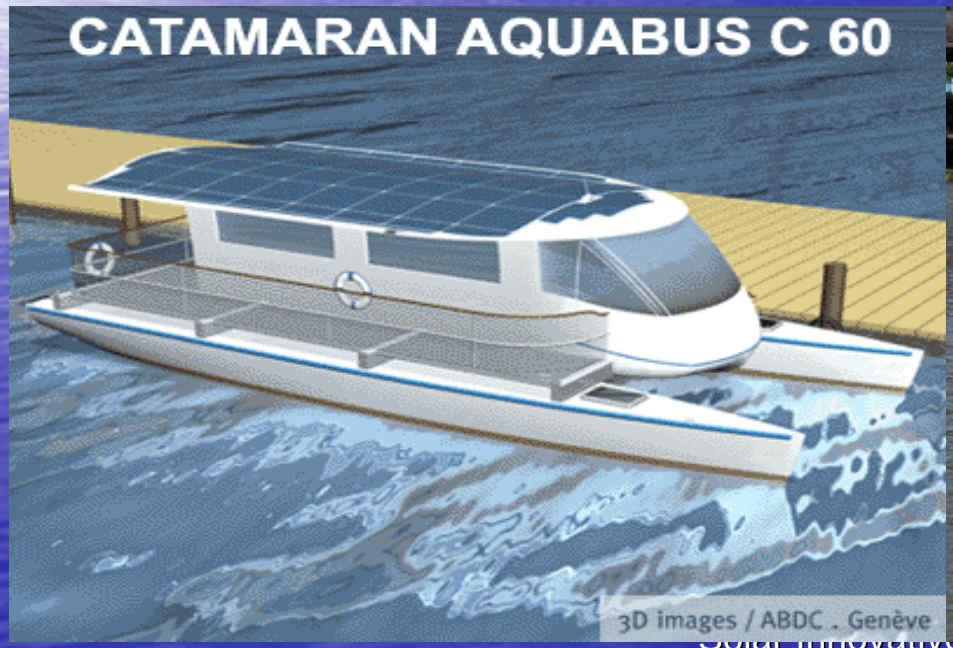
Solar Innovative Contest 3

อ.ธวัชชัย สุวรรณคำ

Solar Innovative Contest 3

อ.ธวัชชัย สุวรรณคำ

3D images / ABDC . Genève


CATAMARAN AQUABUS C 60
3D images / ABDC . Genève

(C) 2000, 2001, Schäfer/Wiese

Venus Solar Airplane

Solar Innovative Contest 3

อ.ธวัชชัย สุวรรณคำ

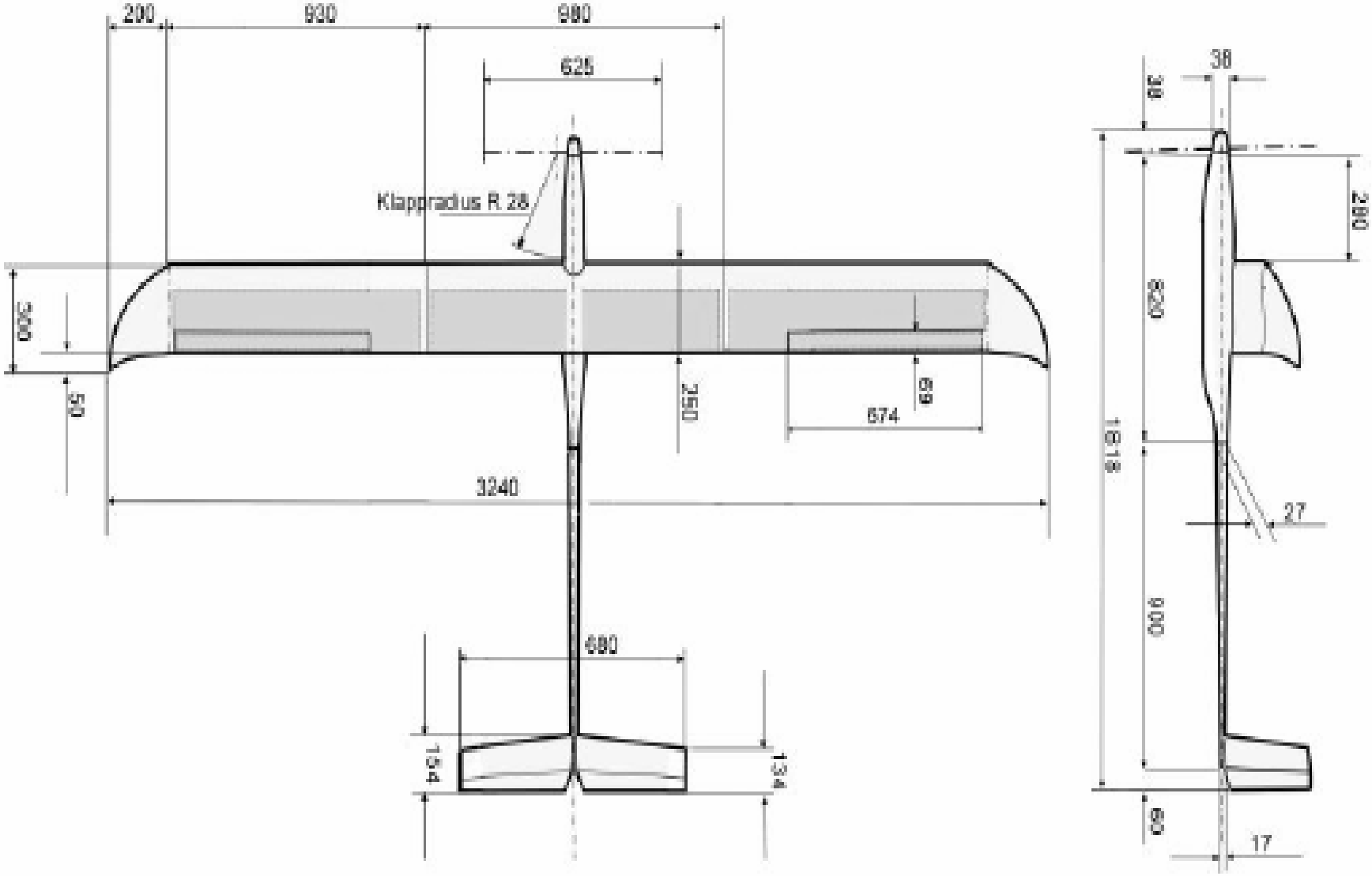


Fig. 1. Sky-Sailor demonstrator v1.1

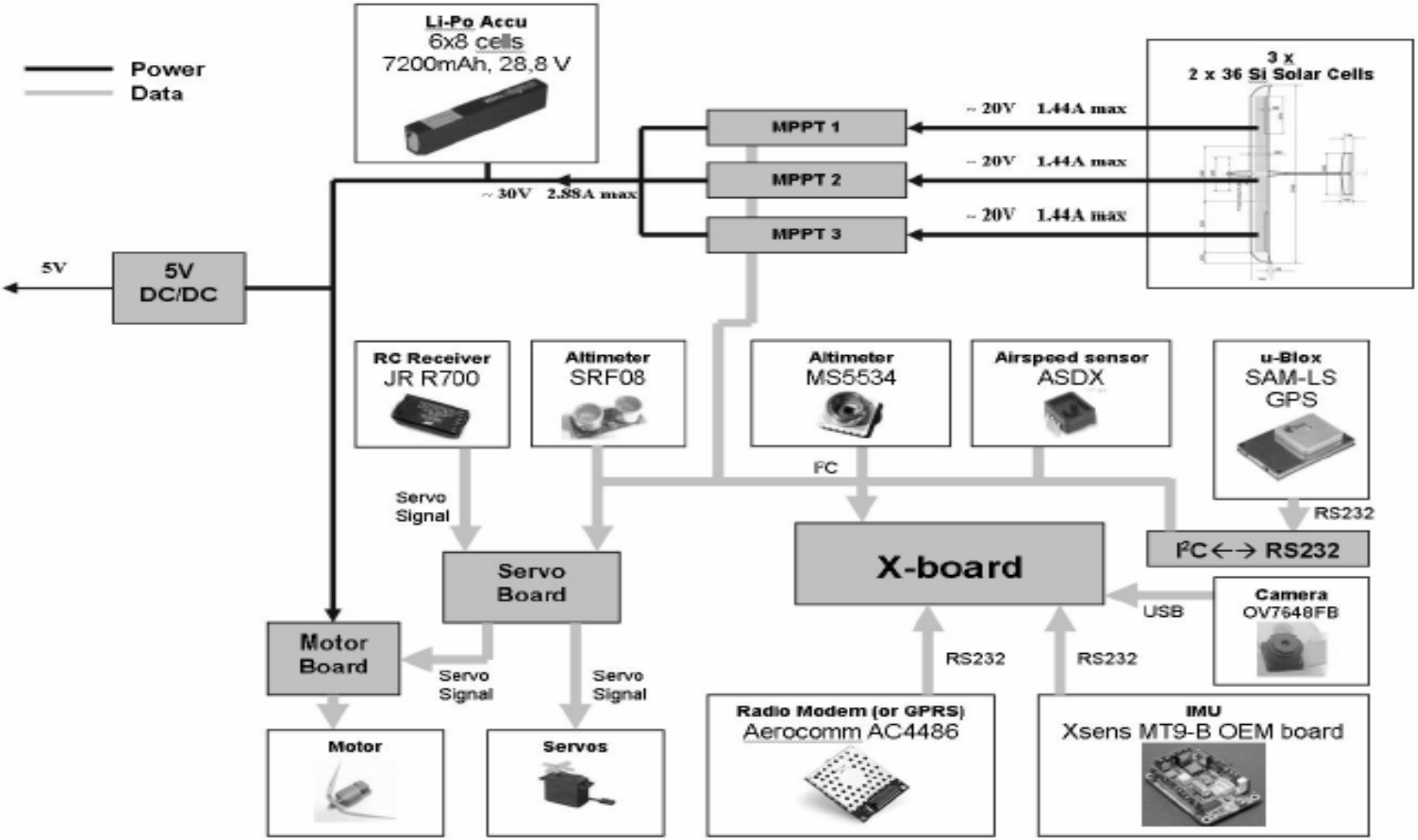


Fig. 3. Systems overview of Sky-Sailor Demonstrator

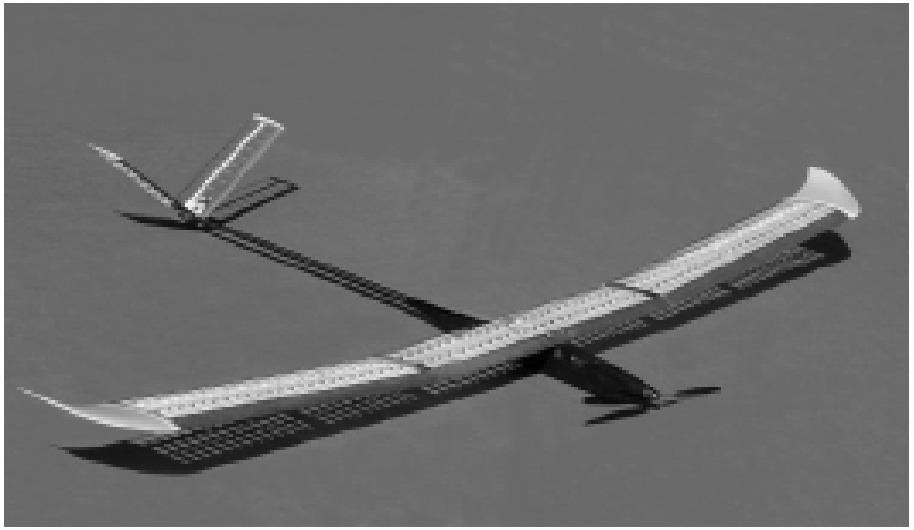
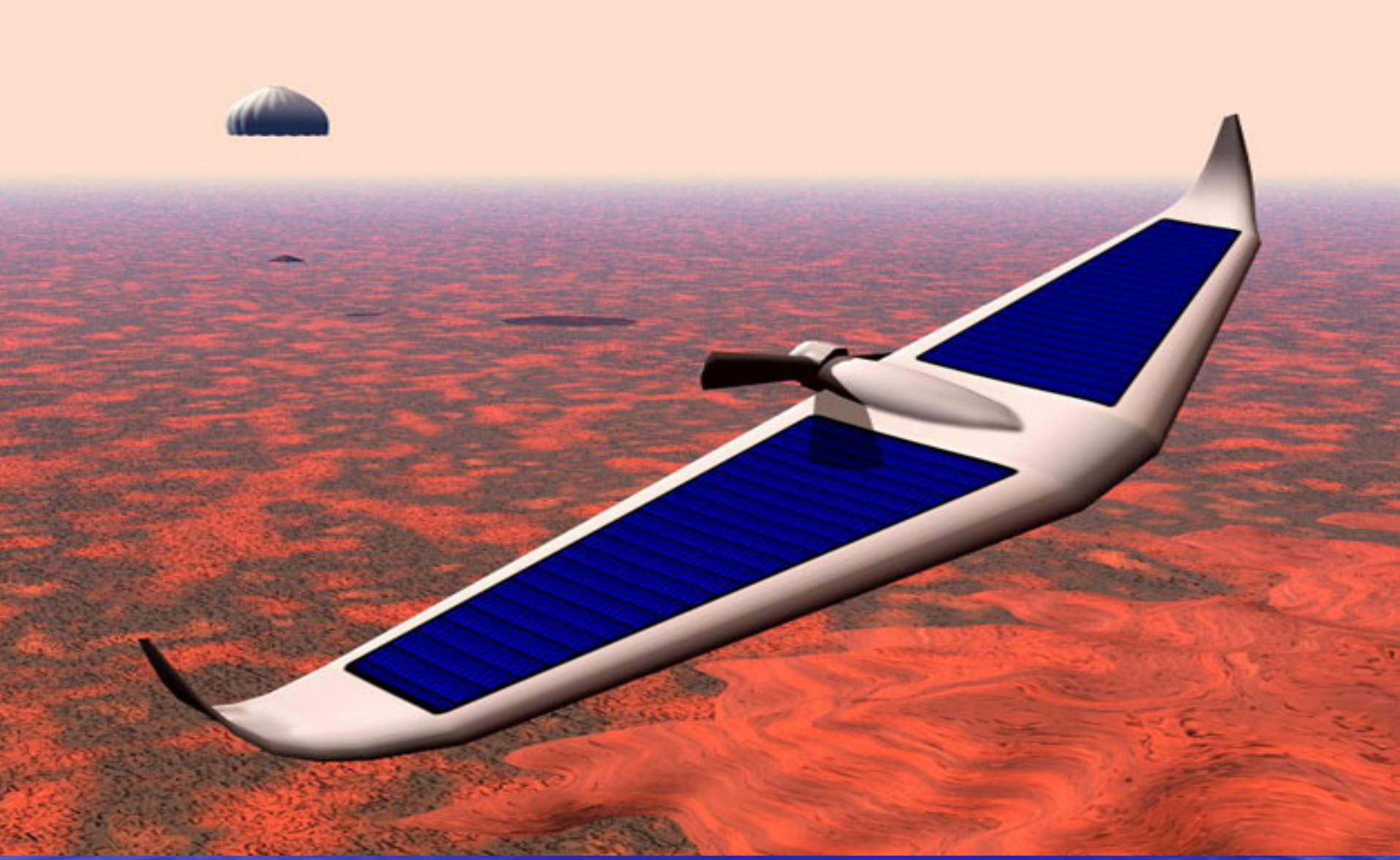


Fig. 5. First version of Sky-Sailor glider

By PETER PAE, TIMES STAFF WRITER

An elongated flying wing, covered with solar panels and powered by 14 propeller motors not much stronger than hair dryers, climbed to 96,500 feet Monday, shattering a flight record that for more than a quarter century seemed unbreakable.



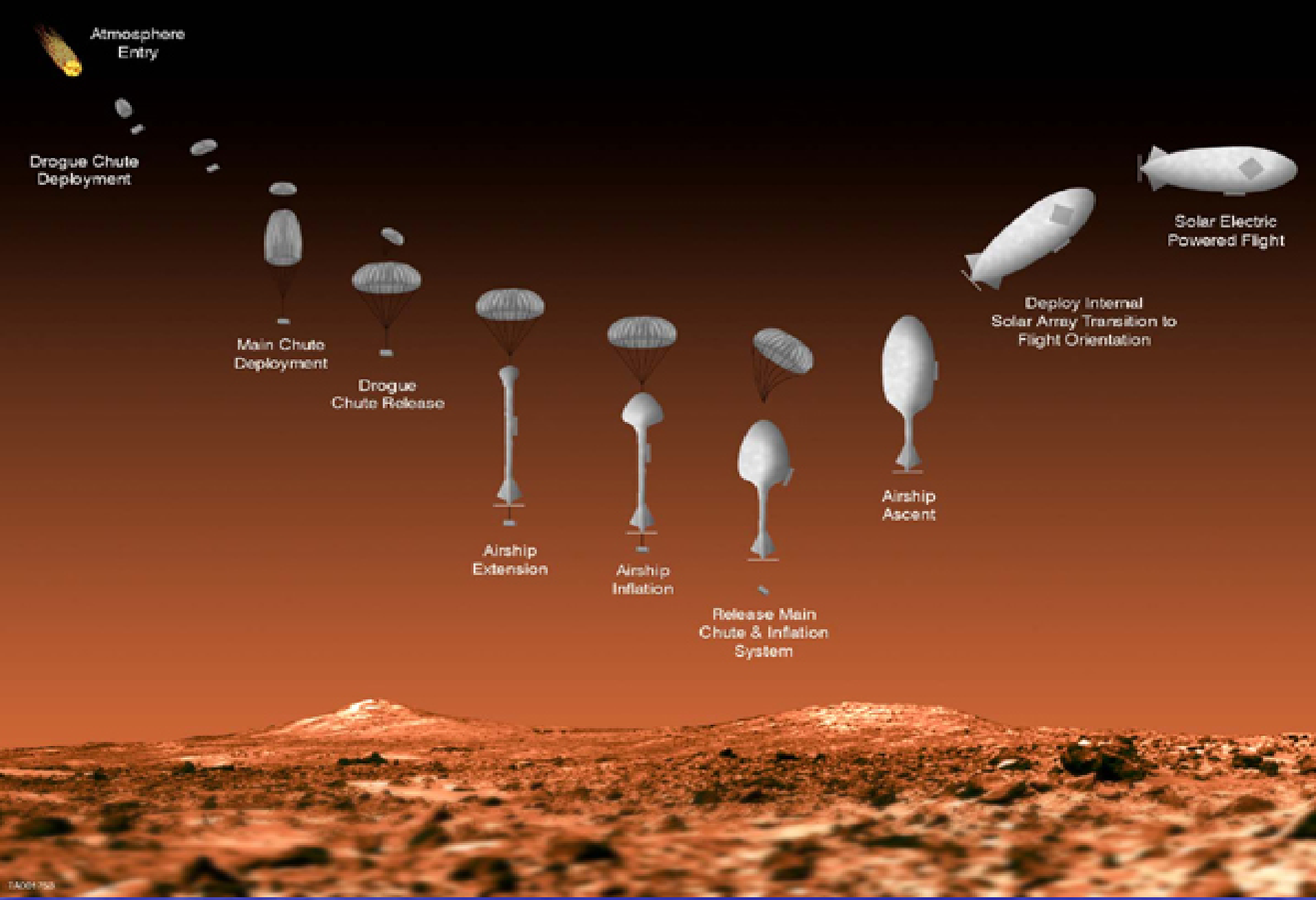
Mars wing slips over the Red Planet, thinking its way across the terrain and in search of landing spot. Credit: G. Frederick/Oregon Public Education Network

Solar Innovative Contest 3

อ.ธวัชชัย สุวรรณคำ

Mars wing team members ready plane for series of test flights.

Photo Credit: Barbara Sprungman



Solar Innovative Contest 3

อ.ธวัชชัย สุวรรณคำ

Who own the Sun ?

Solar Innovative Contest 3

อ.ธวัชชัย สุวรรณคำ