Country Report
Saudi Arabia

Dr. Sultan Al-Sultan
Director, Gulf Innovation Research Institute
Riyadh, Saudi Arabia
E-mail: rseconsultant@gmail.com
Outline

- Saudi Arabia Satellites in Space & National Science, Technology and Innovation Plan
- Legislation
- Public awareness
- Capacity Building
- Participation in UNISEC-Global Activities
- Contribution to Private Sector
- Conclusions
The National Science, Technology and Innovation Plan provides KSA with the strategic vision to join knowledge-based economies ...

Long Term - 20 year National Plan for Science, Technology & Innovation

<table>
<thead>
<tr>
<th>1st 5-Year Plan</th>
<th>2nd 5-Year Plan</th>
<th>3rd 5-Year Plan</th>
<th>4th 5-Year Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Establish infrastructure for science, technology and innovation</td>
<td>▪ Become a leading country in science, technology and innovation in the region</td>
<td>▪ Become a leading country in science technology and innovation in Asia</td>
<td>▪ Transform to a knowledge-based economy</td>
</tr>
</tbody>
</table>

Saudi Arabia

2010

Middle East

2015

Asia

2020

Global

2025
NSTIP implementation throughout the Kingdom Institutions....

NSTIP Framework

National Science, Technology, & Innovation Plan (NSTIP)

Ministries and Governmental Institutes

Research & Educational Institutes

Private Sector

Society

Technology Transfer

R&D Capabilities

Infrastructure

Regulations

Financial Resources

Human Resources

Strategic Technologies
In regards to innovation, KACST will keep on focusing on 15 technological areas that have been identified as critical for KSA.

### Advanced Technologies Program

<table>
<thead>
<tr>
<th>Technology Priorities for KSA</th>
<th>Examples of KACST R&amp;D Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>King Abdullah Initiative for Water Desalination by Solar Energy.</td>
</tr>
<tr>
<td>Oil and Gas</td>
<td>(Largest Plant in the world at Khafji City, KSA)</td>
</tr>
<tr>
<td>Petrochemicals</td>
<td>King Abdullah Initiative for Arabic Content</td>
</tr>
<tr>
<td>Nanotechnology</td>
<td>(Dramatically increasing Arabic internet content)</td>
</tr>
<tr>
<td>Biotechnology</td>
<td>Design of Next Generation System on Chips and Supercomputers. (First Construction of SOC and Supercomputers in the MENA Region)</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Complete Genome Sequencing</td>
</tr>
<tr>
<td>Electronics and Communications</td>
<td>(Date Palm and Camel Genomes mapped completely)</td>
</tr>
<tr>
<td><strong>Space and Aeronautics</strong></td>
<td>Advanced Satellite Technology Development</td>
</tr>
<tr>
<td>Energy</td>
<td>(From Nano Satellites to Geostationary Satellites)</td>
</tr>
<tr>
<td>Environment</td>
<td></td>
</tr>
<tr>
<td>Advanced Materials</td>
<td></td>
</tr>
<tr>
<td>Mathematics And Physics</td>
<td></td>
</tr>
<tr>
<td>Medical and Health</td>
<td></td>
</tr>
<tr>
<td>Agriculture Technology</td>
<td></td>
</tr>
<tr>
<td>Building and Construction</td>
<td></td>
</tr>
</tbody>
</table>
KACST established Joint International Centers of Excellence with World Leading R&D Organizations

KACST Joint Centers of Excellence

<table>
<thead>
<tr>
<th>International Universities and Institutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIT (USA)</td>
</tr>
<tr>
<td>Stanford (USA)</td>
</tr>
<tr>
<td>Oxford (UK)</td>
</tr>
<tr>
<td>Cambridge (UK)</td>
</tr>
<tr>
<td>UCLA (USA)</td>
</tr>
<tr>
<td>UCSD (2) (USA)</td>
</tr>
<tr>
<td>Northwestern (USA)</td>
</tr>
<tr>
<td>Chinese Academy of Sciences</td>
</tr>
<tr>
<td>Belarus Academy of Sciences</td>
</tr>
<tr>
<td>CSIR (South Africa)</td>
</tr>
<tr>
<td>C-DAC (India)</td>
</tr>
<tr>
<td>NASA (USA)</td>
</tr>
<tr>
<td>Fraunhofer (Germany)</td>
</tr>
<tr>
<td>EMPA (Switzerland)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>International Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM (2) (USA)</td>
</tr>
<tr>
<td>Intel (3) (USA)</td>
</tr>
<tr>
<td>Boeing (2) (USA)</td>
</tr>
<tr>
<td>Clariant (Germany)</td>
</tr>
<tr>
<td>Selex (UK)</td>
</tr>
<tr>
<td>Si-ware (France)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Institutes Joint Centers of Excellence</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIT (USA)</td>
</tr>
<tr>
<td>Stanford (USA)</td>
</tr>
<tr>
<td>Oxford (UK)</td>
</tr>
<tr>
<td>Cambridge (UK)</td>
</tr>
<tr>
<td>UCLA (USA)</td>
</tr>
<tr>
<td>UCSD (2) (USA)</td>
</tr>
<tr>
<td>Northwestern (USA)</td>
</tr>
<tr>
<td>Chinese Academy of Sciences</td>
</tr>
<tr>
<td>Belarus Academy of Sciences</td>
</tr>
<tr>
<td>CSIR (South Africa)</td>
</tr>
<tr>
<td>C-DAC (India)</td>
</tr>
<tr>
<td>NASA (USA)</td>
</tr>
<tr>
<td>Fraunhofer (Germany)</td>
</tr>
<tr>
<td>EMPA (Switzerland)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Companies Joint Centers of Excellence</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM (2) (USA)</td>
</tr>
<tr>
<td>Intel (3) (USA)</td>
</tr>
<tr>
<td>Boeing (2) (USA)</td>
</tr>
<tr>
<td>Clariant (Germany)</td>
</tr>
<tr>
<td>Selex (UK)</td>
</tr>
<tr>
<td>Si-ware (France)</td>
</tr>
</tbody>
</table>
To produce a critical mass of high-quality patents, KACST launched the Technology Innovation Centers (TIC) program.

**Technology Innovation Centers (TIC)**

**Objectives**
- Address economic and social goals of the Kingdom
- Promote university-industry research collaboration and technology transfer in the Kingdom
- Strengthen university research and science and engineering education in KSA

**Achievements**
- Established 5 technical innovation centers in collaboration with Saudi universities

**Technologies**
- Radio Frequency & Photonics
- Carbon Capture & Sequestration
- Solid State Lighting
- Personalized Medicine
- Geoinformatics
Space Strategy

VISION

KSA Space Program should serve the national needs and sustainable development and contribute to the transformation to a knowledge based society.

1st
Establish infrastructure for Space Science, Technology and Innovation (STI)

2nd
Become a leading country in Space STI in the region

3rd
Become a leading country in Space STI in Asia

4th
Participate in the transformation to a knowledge-based economy and society
Space Technology Priority Areas: Space Platforms

- **Areas**
  - Earth observation
  - Navigation
  - Telecommunications
  - Geodesy
  - Space Science and Environment

- **Applications**
  - Development of Satellite Systems
  - Space Services
  - Science Missions
Space Technology Priority Areas: Remote Sensing and GIS

- **Areas**
  - Change detection and monitoring
  - Natural hazards
  - National spatial data infrastructure

- **Applications**
  - Urban development
  - Vegetation
  - Pattern recognition
  - Disaster Management (Dust storms, Floods, Fires (forest, brush-fires) … etc.)
  - Regulations and standards
  - Intelligent transport systems
Space Science

- Near Earth Objects Research
- Micro Gravity Research
- Educational Outreach – NanoRacks
- NASA Collaborations
Occultation of Stars and NEO Tracking

Individual observatories on every continent

- Field units can be operated for local research projects from the member schools, Colleges, Universities and research institutes
- Field units can also be operated as nodes for joint research among member institutions
NASA Collaboration

– NASA Lunar Science Institute (NLSI)
  • Saudi Lunar and Near Earth Object Center affiliate

– NASA Ames Research Center
  • UV-LED Experiment on Saudi Satellite
    • STAR
    • MGRS

– AERONET
– Space Geodesy
Advanced Satellite Technology Development

12 LEO Satellites Launched
180 Satellite Team Members
%20 Females

Complete Indigenous Know-how
National Satellite Technology Center

Basic Facts

Developed, Manufactured, Tested, Launched and Operated

- first two satellites in 2000 (Saudisat 1 A, B)
- third satellite in 2002 (Saudisat 1 C)
- three satellites in 2004 (SaudiComsats 1 and 2, SaudiSat 2)
- 6 Satellites in 2007 (Saudisat 3 and 5 SaudiComsats)
National Satellite Technology Center

Basic Facts

Developed, Manufactured, Tested, Launched and Operated

• first two satellites in 2000 (Saudisat 1 A, B)
• third satellite in 2002 (Saudisat 1 C)
• three satellites in 2004 (SaudiComsat 1 and 2, SaudiSat 2)
• 6 Satellites in 2007 (Saudisat 3 and 5 SaudiComsats)
National Satellite Technology Center

Basic Facts

**Designed and Established (at KACST)**
- design and production facility
- AIT facility at KACST
- two ground stations
Saudi Satellites in Space

**SaudiSat 1 A, B**
- **L:** Sep 26, 2000
- **Oscars:** 41, 42
- **O:** until Sep 2003
- **FeedForward**
- **Amature Radio**

**SaudiSat 1 C**
- **L:** Dec 20, 2002
- **Oscars:** 50
- **O:** Until Now
- **FeedForward**
- **Amature Radio**

**SaudiComSat1,2**
- **L:** June 29, 2004
- **O:** Until Jun 2006
- **Commercial FeedForward**

**Saudisat2**
- **L:** June 29, 2004
- **O:** Until Mar 2005
- **Saudisat-2 First 3-axis control and small imager**
Saudisat 1 C (Oscar 50)


- Status: **Operational**
  - Uplink: 145 MHz FM
  - Downlink: 436 MHz FM

- Weight: 10 Kg

- First use of a terrestrial class solar cells in Space.

- Currently The only satellite in the world providing hand held Amateur Radio Communication.
SaudiComSat 7

- Launched 17 April, 2007.
- Status: Semi-Operational
- Weight: 12 Kg
- VHF uplink.
- S-Band downlink.
- Real-Time or Store-and-Forward.
- More than 2,000 ship transmissions captured during a satellite pass.

First Satellite in the world to provide AIS vessel tracking. Based on this technology we are working on building large satellite constellation to provide commercial real time service.
More on the success of this mission will be presented by Dr. Almajed later as we celebrate the satellite 5 years in orbit.
New Satellite to be launched

SaudiSat-4
**TBL:** Sep 2013
UV-LED experiment

SaudiSat 5
**TBL:** June 2014
Second RS Saudi Commercial Satellites

SaudiGeo 1
**TBL:** Sep 2015
First GEO Communication Satellite
SaudiGeo 1

**TBL**: Sep 2015

First GEO Communication Satellite
SaudiGEo-1

Required Coverage

X band - Gulf Coverage
X Band Steerable Spot Beam

Ka Band Multibeam

16 15 14
12 11 10
9 8 7
6 5 4
3 2 1
KACST Broadband Space-Based Network
Space Technology - Remote Sensing & GIS

- Established within KACST in 1988
- Ground Segment Coverage area:
  - Radius of approx. 2700 km
  - Surface area of 23 million km²
- Simultaneous multi-satellite reception capability
- Directly receive Geoeye-1, Ikonos, Spot, RadarSat.
TAQNIA will ensure that full economic impact potential of the selected technologies is achieved for KSA

**TAQNIA desired impact**

1. **Global and Local Innovations…**

2. **…successfully commercialized by Taqnia…**

3. **Investing in the right ideas through capital, ideas, market access channels and infrastructure to make them market sustainable…**

4. **…to create the GDP impact…**

5. **..through a sustainable eco-system of SMEs…**

6. **..and delivering local talent, skills & jobs**
Legislation

- Prepare space and geospatial data infrastructure law & act
- Propose a legislation in Saudi parliament to establish a space strategic consortium between the government institutes.
  - This consortium will include ministry of trade and industry, ministry of higher education, ministry of information technology and communication, ministry of Education and Private sector to promote the space engineering R&D and Education and space industries.
- Approve a legislation to establish the national authority for intellectual property which will be of great importance in space industries. The proposal was welcomed by most of the parliament members.
- Approve legislation on establishing water security council in the kingdom of Saudi Arabia
Space and geospatial data infrastructure law & act

There are many motivations to propose and develop this law & act.:

- National Security
- National Needs (water, Oil resources, ..etc)
- Capacity Building
- Space assets
- Coordination between Governmental and private sectors
Public awareness

- Introducing UNISEC activities at the Fifth Saudi Scientific Conference (SSC) organized by Ministry of Higher Education, Riyadh April 30 - May 1, 2014.

- Organize seminar about MIC3 and UNISEC activities during the 9th National GIS Symposium in Saudi Arabia, April 28 - 30, 2014, Dammam.

- Organizing a seminar about MIC3 and CanSat Education at King Fahd University of Petroleum and Minerals on April 21, 2014.
Capacity Building

• Coordination with National Satellite Research & Development Center and King Abdel-Aziz City of Science and Technology (KACST) to hold a CanSat Training Program next January 2015 for two weeks in Riyadh.

• Disseminate Information about the coming course to the national universities.

• Prepare the course material and the required hardware

CanSat BBM    CanSat Assembly and Integration
University Space Engineering Consortium (UNISEC) and Capacity Building in Space Science and Technology for Sustainable Development of the Kingdom of Saudi Arabia

Presenters
Dr. Sultan Hasan AlSultan
International Society of Photogrammetry and Remote Sensing (ISPRS). Saudi Arabia

University Space Engineering Consortium (UNISEC) is a consortium of universities interested in space science and technology and their applications. UNISEC main pillars are human resource development, technological development related to space engineering and outreach activities. One of the very fundamental tools in space engineering education used by UNISEC is the CanSat which is a pico satellite place inside a can of soda. CanSat can be built using the commercially available components by university students or high school students. In this presentation an Introduction about UNISEC and UNISEC activities will be given. A proposal to hold CanSat Training Program will be proposed to contribute to the kingdom capacity building in basic space science and technology. In this program about 10 university instructors will be trained to design, fabricate, test and launch a Pico-satellite to sub-orbital altitude using Helium balloons. The instructors with science and engineering background and their teaching and/or research field related to space science and technology are qualified to join this program.

Avenue
Date, Time — for more information please contact us.
Participation in UNISEC-Global Activities

- Participating in MIC3 with idea titled “Space-Based System for Short-Term Earthquake Warning”

- Submit a research proposal titled “Nanosatellite Applications for water management” in the 2nd UNISEC-Global meeting.
Contribution to Private Sector

- Establishment of “Gulf Innovation Research Institute (GIRI) in Saudi Arabia. Its mission is to provide R&D in space science and remote sensing. Conduct and Geospatial infrastructure data technology.
Conclusions

- Working on space and geospatial data infrastructure law & act and establishing national geospatial center(s).
- Complete the preparation of CanSat Training Program next year.
- Increase the public awareness of space engineering education.
- Participating in UNISEC-Global activities.
- We are going apply for NSTIP fund from Mistry of Higher Education to secure funding the future UNISEC-KSA activities.
Volunteer Opportunities

- Meet New People
- Education services
- Workshops

and many more opportunities

to Join Us Please Contact:
Email: comput321@gmail.com
Mobile: +966504890977