

The 5th CSIR  
**CONFERENCE**

**IDEAS THAT WORK**

8-9 October 2015 | CSIR ICC

**Making the Invisible Visible:  
UViRCO, An Innovation  
Success Story**

Jeremy Wallis

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CELEBRATING  
**70** Years  
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- The Eskom / CSIR Story
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- Where did it happen at CSIR?
- Key ingredients in making innovation happen
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# The Innovation

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1991

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Collaborative research and  
camera development



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1991 to 2008

2008

 UVIRCO  
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2015

In the past 4 years:

- >R100m sales
- 38% annual growth
- 55% world market

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# The Eskom / CSIR / UViRCO Story

- *What was driving it from the market side?*

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Power lines & sub-stations make use of numerous insulators



- Degradation of insulators can quickly lead to power supply failure
- Insulators are not easy to manually inspect due to the high voltages involved and, often, their distance from the ground
- In the early 1990s new polymer-based insulators were coming to market and hence, for this, and a number of other reasons, **the need arose to research new approaches to inspecting electrical insulators for both lab research and for field inspection.**

# The Eskom / CSIR / UViRCO Story

## - What was the technical challenge?

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- Degraded insulators create electrical discharge phenomena due to electrical breakdown of gas molecules in the air:
  - These are referred to as **CORONA**
- **Corona discharges:**
  - Waste electrical energy
  - Can create corrosive nitric acid
  - Create ozone
  - Create light emissions in the ultra-violet (UV) wavelength band
- **The technical challenge therefore was:**
  - Can the low-intensity Corona UV emissions from a power line be detected and imaged in order to provide a new method to inspect insulators?
  - *In essence, can you make the invisible visible?*



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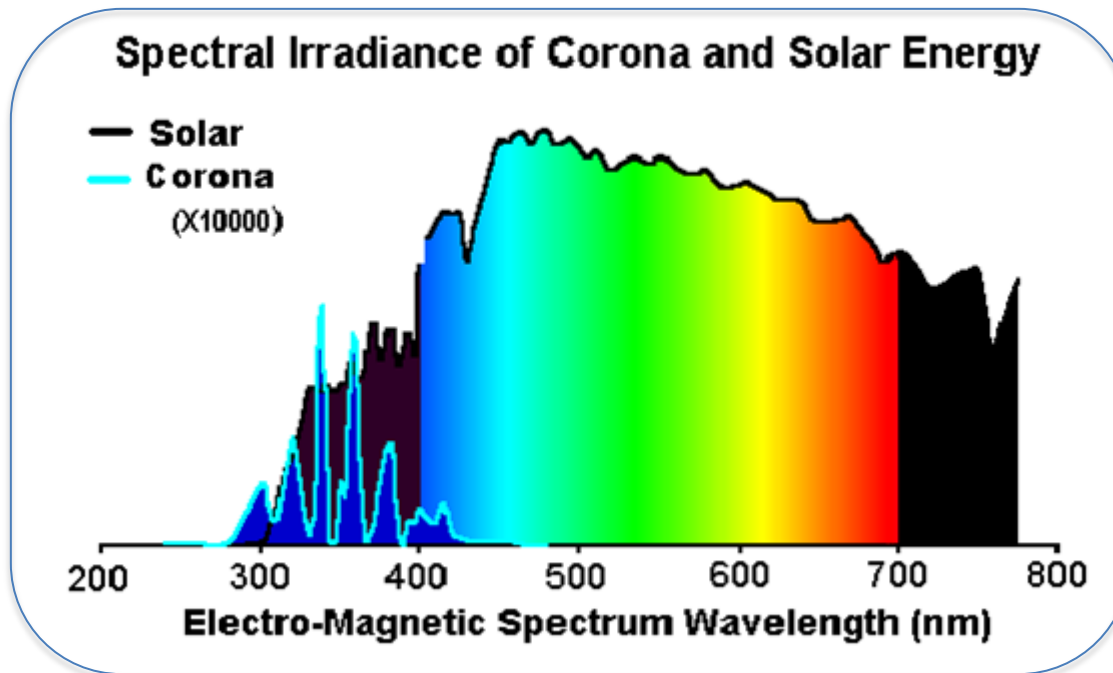
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# The Eskom / CSIR / UViRCO Story

## - The Physics

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How easy is it to detect the Corona UV discharges from a power line?



CSIR chose to work at the 340 & 360 nm lines

*And this set Eskom & the CSIR off on journey that now spans more than two decades!*

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# The Eskom / CSIR / UViRCO Story

*- The first prototypes are developed*

- By 1993, a first prototype had been developed and so the “CoroCAM” range of Corona detection cameras was born



- CoroCAM I was designed for night-time use in order to avoid the solar UV that would have dominated the much smaller Corona UV signals

- Updated versions of the CoroCAM I were sold up to 2010



- Early clients included power utilities, insulator manufacturers and researchers as far afield as France, Thailand, Argentina and the USA.



# The Eskom / CSIR / UViRCO Story

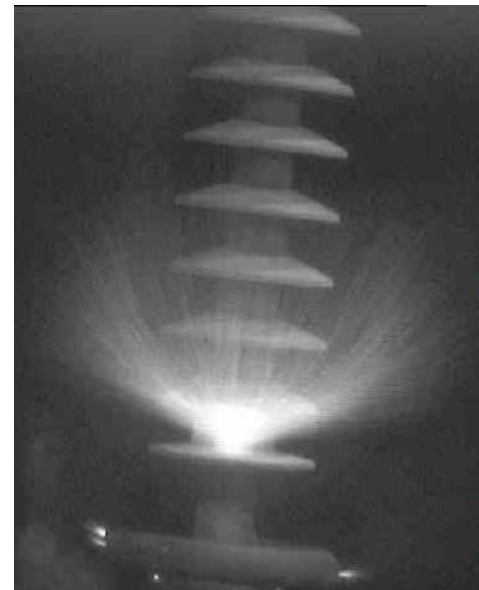
- *The cameras start to evolve*

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- By 1994, a higher resolution camera had been developed, CoroCAM III



- CoroCAM III was also a night time camera system



- Updated versions of the CoroCAM III were sold up to 2009



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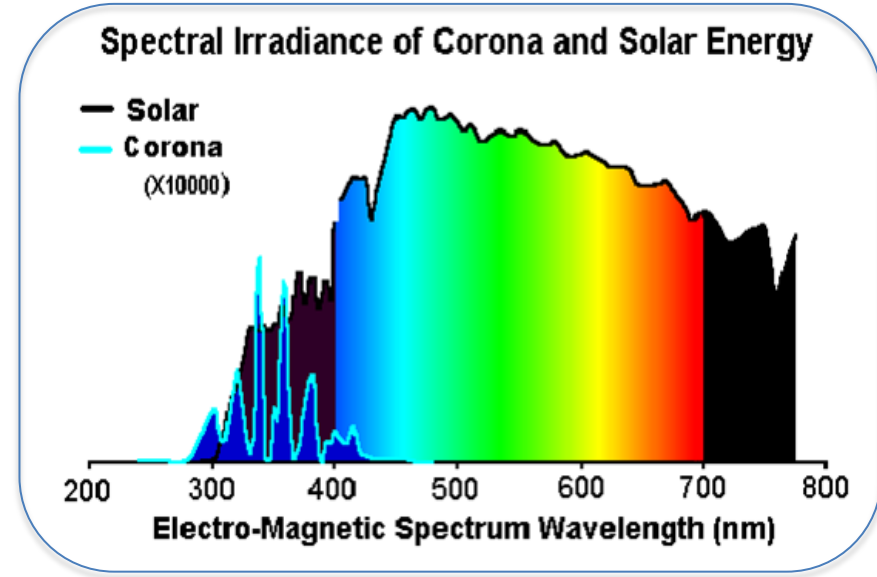
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# The Eskom / CSIR / UViRCO Story

*- The market demands a daylight system*

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- In the late 1990s The CSIR turned to the issue of daylight detection of corona
- Initial approach: UV filter & shutter synchronisation technologies, still operating in the 340-360 nm region
- Early attempts experienced detection sensitivity issues due to the competing solar UV

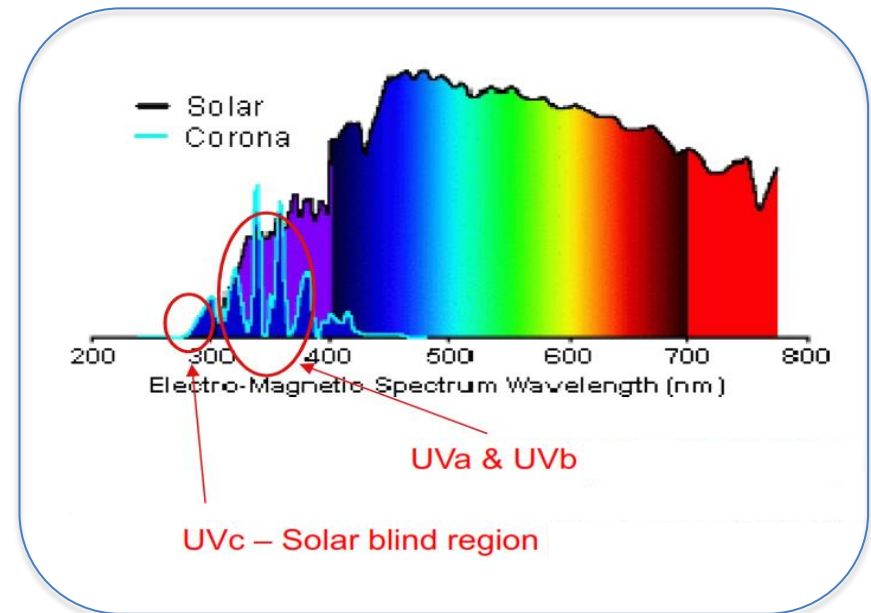


# The Eskom / CSIR / UViRCO Story

- Daytime inspection system – a world first

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- By 1999, The CSIR made the move sub-300 nm to avoid solar UV



- Full daylight inspection became possible with the release of the CoroCAM IV & IV+ ... this had real commercial prospects.
- This was the world's first daylight UV inspection camera.

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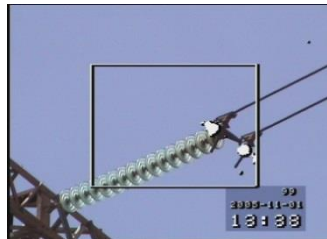
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# The Eskom / CSIR / UViRCO Story

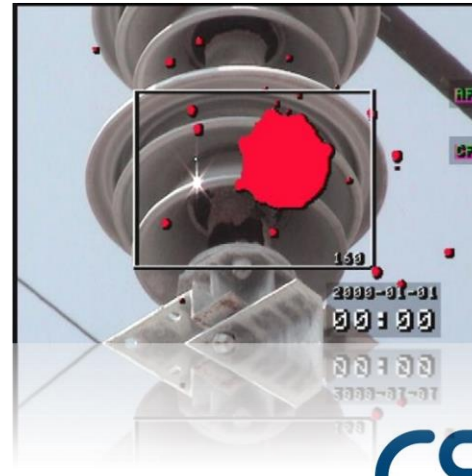
- *Cameras gain significant market acceptance*

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- By the late 1990s there was a dedicated CSIR & Eskom team behind the CoroCAM developments and a network of international agents had been started as a way to service the enquiries that had started to be received from around the world.
- 2005 saw the appearance of the more modern looking CoroCAM 504 and with the international market having now accepted this new inspection technology it was clear that CSIR should commercialise



*Including  
'CoroSOFT'  
software*



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# The Eskom / CSIR / UViRCO Story

## - Commercialisation, innovation continues

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- 2006 saw the formal commercialisation process start at The CSIR
- Different business models were considered
- A spin-out model was accepted which saw UViRCO Pty (Ltd) created in 2008 and six CSIR staff members moved to the start-up
- UViRCO was licensed to manufacture the CoroCAM I, III, 504 and the world's first 3-in-1 Visible-UV-Infra-Red camera, the MultiCAM, that was completed with Eskom funding support in 2006.



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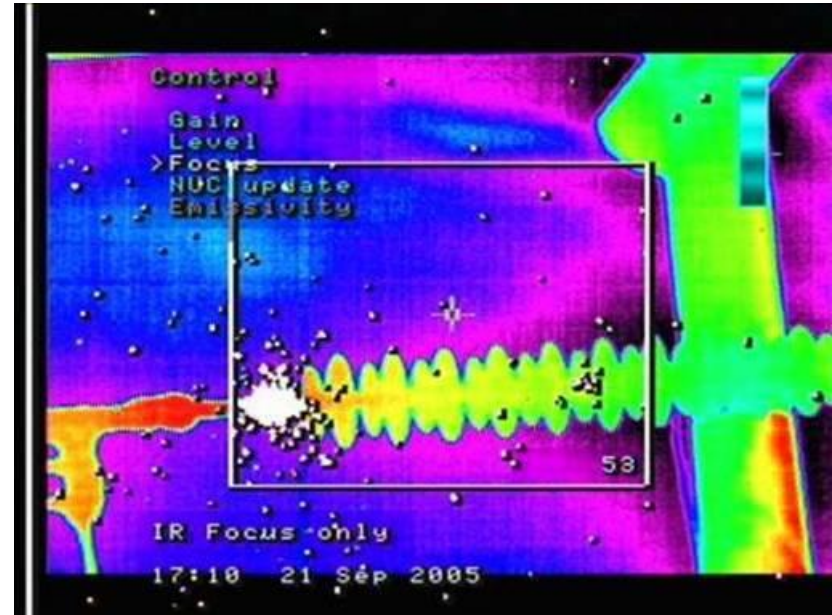
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- *Tri-band inspection system – a world first*

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- The MultiCAM enabled overlaying of images in three different wavelength bands and extended the range of faults that could be detected.



- And at this stage the story moves to The CSIR Startup UViRCO.

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# UViRCO – A CSIR High Tech Start Up

*- UViRCO is established*

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- UViRCO was established in 2008 and setup its facilities at the Persequor Techno Park near The CSIR
- UViRCO was licensed the CoroCAM and MultiCAM products for:
  - Manufacturing
  - Marketing, Sales & Distribution
  - Ongoing product & technology updates
- UViRCO benefitted from an incubation period at The CSIR while:
  - The technology & products matured and
  - The international market warmed up to the adoption of the systems into mainstream use
- It's noted that CSIR-wide R&D Outcomes capacity became a reality post 2006 after the Beyond-60 transition and this drove the commercialisation.

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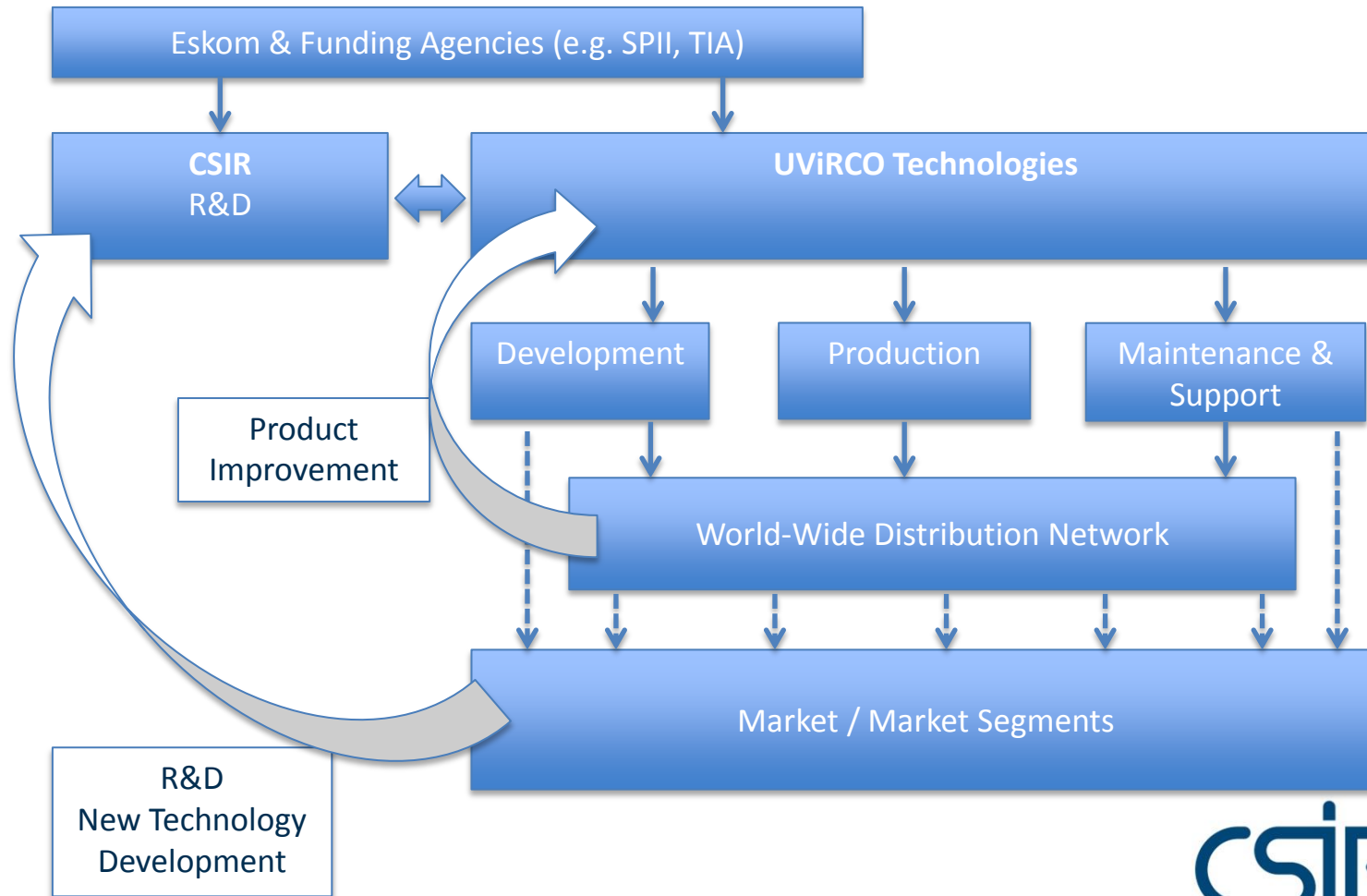
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# UViRCO – A CSIR High Tech Start Up

- UViRCO business model

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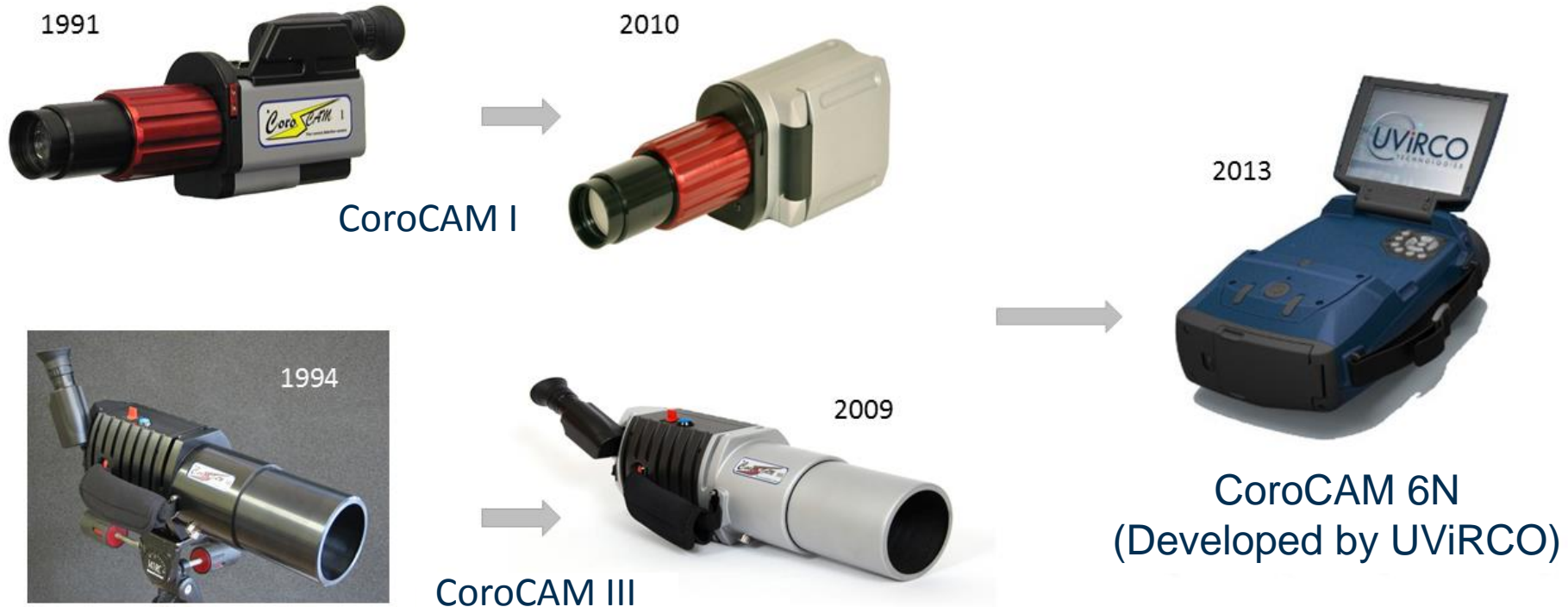


# UViRCO – A CSIR High Tech Start Up

- Streamlining of the night-time product range

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## Evolution of the night-time, high resolution UV imaging system



# UViRCO – A CSIR High Tech Start Up

- Streamlining of the day-time product range

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## Evolution of the day-time, visible & UV imaging system



CoroCAM IV+



CoroCAM 504  
(Licensed in 2008)



CoroCAM 6D  
(Developed by UViRCO)

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# UViRCO – A CSIR High Tech Start Up

- Streamlining of the Multi-Spectral system

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Evolution of the triple-band, day-time, visible, UV & Infra-Red imaging system



MultiCAM  
(UV+IR+Video)



MultiCAM  
(Licensed in 2010)



CoroCAM 8  
(Radiometric Thermal)

Note: A fully radiometric UV and radiometric IR system is also under development under TIA funding for launch 2017

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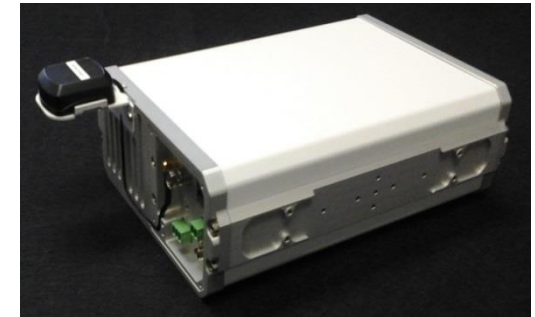
- *Product diversification begins*

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## Other New Product Developments at UViRCO / CSIR



CoroCAM 6D2  
(Day & Night)



CoroCAM 6DF/NF (Fixed Mount Systems)



VMI – Vehicle  
Mounted  
Inspection  
system  
(UV+IR+HD Video +  
Optical Tracking)



GasCAM  
Optical gas detection  
for electrical switch  
gear of Sulphur  
Hexafluoride  
(under development  
at CSIR)

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# UViRCO – A CSIR High Tech Start Up

- *Integration for aerial inspection*

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## Helicopter & UAV Gimbal Mounted Systems



Market-based requirement from Utilities and Service Companies

# UViRCO – A CSIR High Tech Start Up

- Clients

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SEVES  
SEDIVER



GE Global Research



هيئة كهرباء ومياه دبي  
Dubai Electricity & Water Authority



UNIVERSITEIT  
STELLENBOSCH  
UNIVERSITY

Universitas  
Gadjah Mada



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# UViRCO – A CSIR High Tech Start Up

- *UViRCO an international market player*

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- As of 2015 UViRCO has sold several hundred cameras
  - International network of 32 distributors
  - CoroCAM & MultiCAMs sold into >40 countries
- In the past 4 years:
  - UViRCO has achieved a turnover of R116m
  - Achieving annual growth of 38%
- UViRCO's brand is associated with:
  - High quality products (very low repair rate)
  - Focused on satisfying existing & emerging market needs
  - Great customer support.



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# Where did it happen at CSIR?

- *The Sensor Science & Technology group at MSM*

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- The CoroCAM and MultiCAM technologies and products were developed at The CSIR's **Materials Science & Manufacturing Unit**, in its Competence Area "**Sensor Science & Technology**"
- **This team sees their 'noble cause' as:**  
"Responding to South Africa's challenges with sensor innovations"
- **And part of their Mission is to:**  
"Take responsibility for the innovation chain"
- They are committed to connecting their SET capabilities with industrial challenges whilst meeting the CSIR's strategic objectives.

# Where did it happen at CSIR?

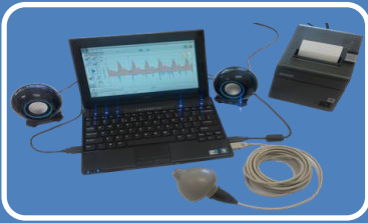
- Also from this innovative team

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## Ultrasonic Broken Rail Detection System

- Co-developed with Institute for Maritime Technology
- Helps Transnet Freight Rail avoid R100m's of derailment costs annually
- Implemented on 860 km Sishen-Saldanha line, a world first



## Umbiflow

- A Doppler ultrasound system targeted at primary health care clinics
- Proven ability to reduce referral & health care costs for pregnant mothers
- Currently in a clinical trial in Tshwane district to assess impact on perinatal mortality rates



## Sonar wet-end transducers & arrays for the SA & foreign navies

- R&D Partner to Armscor & SA Navy for next generation sonars
- Sonar transducers supplied to the SA Navy operational submarine & surface fleet

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# Key ingredients for innovation

*- Hard work, belief & perseverance!*

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A clearly articulated need

A real technical challenge to be solved

Champions who led at Eskom, e.g.  
Wallace Vosloo  
Logan Pillay  
Barry MacColl  
Simon Higgins  
Nishal Mahatho

Champions who led at CSIR, e.g.  
Roel Stolper  
Dirk Lindeque  
Werner Merbold  
Ockert Henning,  
Jaco Hart

Eskom's open mind, appetite for R&D risk and bigger picture view

CSIR's IP, licensing & tech transfer skills  
(Johan le Roux, Liesbeth Botha, Johan Hattingh, Delon Mudaly, Chris Sturdy, Jeremy Wallis)

The team who spun-out from CSIR's, their visionary efforts, entrepreneurial spirit, technical abilities, hard work & perseverance  
(Dirk, Ockert, Jaco, Tertius, Alastair, Rocky)

Belief @ Eskom and CSIR that it was all worth doing

Resilience to carry the torch, it wasn't always easy

Funding that allowed the team to stay with it beyond the short term

The people who continued to raise funding year by year

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# The future

- UViRCO's vision is to remain the market leader
- Regularly release next generation systems & penetrate new markets
  - By itself and in collaboration with The CSIR
- Drive the establishment of a new international standard in UV Quantification
  - In collaboration with Eskom, The CSIR & CIGRE (International Working Group)
- Increased intelligence in all products
- Reduce manufacturing costs
- Constant focus on quality and customer care.

# The future

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- In the 2016-17 financial year CSIR will formally exit its share to a BEE Partner and UViRCO will then be truly afloat in the world market, shining the torch of innovation for South Africa.



We thank you for the journey!



We wish you well!





# Thank you

Special thanks to the many CSIR & Eskom staff who made this journey possible for your time, energy, commitment and willingness to stay the course with us 😊