

DESIGN & IMPLEMENTATION OF TOWER AIR TRAFFIC CONTROL SYSTEM

RAPID COGNITION & AUGMENTED COGNITION

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SCOPE

- ❑ PROBLEM SPACE
 - ❑ CONTEXTUAL CHALLENGES
 - ❑ CREATIVE IDEAS
 - ❑ INNOVATIVE SOLUTIONS
 - ❑ DISCOVERY
 - ❑ GAME-CHANGER
-

PROBLEM SPACE

□ CLUTTERED ENVIRONMENT

□ COMPLEXITY

□ PERTURBATIONS

CONTEXTUAL CHALLENGES

□ UNIQUELY SINGAPORE

□ SPACE

□ TIME

□ LOAD

□ AVIATION HUB
(SIMPLE-COMPLICATED-COMPLEX)

UNIQUELY
SINGAPORE

CHANGI INTERNATIONAL AIRPORT



SINGAPORE

SINGAPORE

SIZE MATTERS

LITTLE RED DOT

CHALLENGES 20km

10mils

 international airport

South East Asia

Last updated: 24 Jan 97

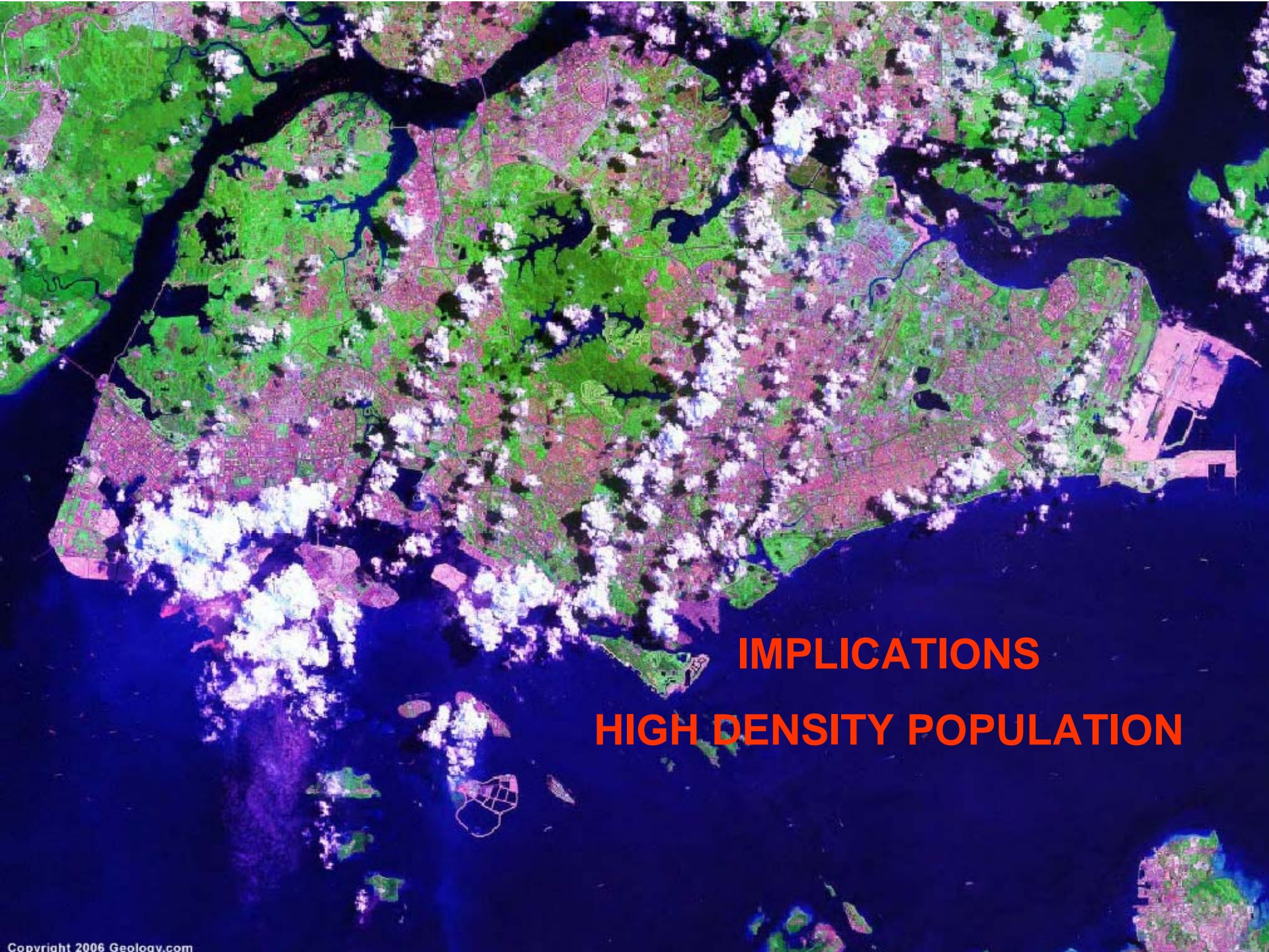


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OUR SIZE
20 by 40 KM





**IMPLICATIONS
HIGH DENSITY POPULATION**



**HIGHLY URBANIZED
CITY STATE**



**RESTRICTIONS OF FLYING OVER
POPULATED, PROHIBITED &
RESTRICTED AREAS**





GROWING CHANGI INTERNATIONAL AIRPORT

From a single terminal in its formative years, Changi Airport now operates four terminals – Terminals 1, 2 and 3, as well as the Budget Terminal. The latest addition to Changi Airport, Terminal 3, commenced operations on 9 January 2008 and increased Changi Airport's passenger handling capacity by 22 million passengers per annum. With a total handling capability of 70 million passengers per annum, Changi Airport is well-positioned to serve Singapore's future aviation needs well into the future.

The Leading Aviation Gateway to Asia Pacific

Singapore is an excellent springboard for travel around the region. Within a seven-hour radius, Changi Airport has the potential to reach 2.8 billion people living in Southeast Asia, Australia, China and India. With some 84 airlines flying to and from more than 188 cities in over 60 countries worldwide, operating more than 4,500 flights per week, Changi Airport remains well-positioned as the international gateway to Asia Pacific, with superior connectivity to the Southwest Pacific and Southeast Asia.

A large commercial airplane is shown on a runway, viewed from a low angle. The plane is white with a dark blue tail and wings. The background is a clear blue sky with some light clouds. The foreground is a green grassy field.

GROWING PREMIUM AIR HUB

North & South East Asia



CHANGI INTERNATIONAL AIRPORT TRAFFIC VOLUME

VOLUME	Dec 07	Jan - Dec 07
Passenger Movements	3,514,000 (+2.8%)	36,702,000 (+4.8%)
Airfreight Movements	165,000 (-0.6%)	1,895,000 (-0.9%)
Aircraft Movements	19,000 (+1.9%)	221,000 (+3.0%)



CHANGI INTERNATIONAL AIRPORT TRAFFIC VOLUMES

VOLUMES	Dec 08	Jan - Dec 09
Passenger Movements	3,490,000 (-0.6%)	37,203,978 (+2.7%)
Airfreight Movements	129,000 (-21.4%)	1,633,791 (-0.2%)
Aircraft Movements	20,000 (+7.4%)	240,360 (+5.1%)

Figures are rounded to the nearest thousand
Growth % are in comparison with the same period last year



SKYTRAX

"WORLD BEST AIRPORT 2010"

GROWING UP TO 4 TERMINALS WITH MULTIPLE RUNWAY OPERATIONS



Premier Airhub of region

CREATIVE IDEAS

□ WHAT SO GREAT ABOUT VAPS?

□ LOGIC BEHIND

- AUGMENTED COGNITION
- RAPID COGNITION

□ VAPS DEFINED

- VIRTUAL ASSISTANTS
 - PERSISTENT SENTINELS
-

CREATIVE IDEAS

□ AUGMENTED COGNITION

- CIRCUMVENTING HUMAN COGNITIVE LIMITATIONS & AIDING HUMAN'S ABILITIES TO PROCESS, STORE & RETRIEVE INFORMATION
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CREATIVE IDEAS

□ RAPID COGNITION

- RAPID INFORMATION INGESTION AND ASSIMILATION WITH CONTEXTUAL KNOWLEDGE THROUGH SMART USE OF VISUALISATION TECHNIQUES.
-

INNOVATIVE SOLUTIONS

□ VAPS

- SMART BOLTS THAT PERSISTENTLY & PERVASIVELY AID AIR TRAFFIC CONTROLLERS BY PERFORMING SIMPLE LOW-LEVEL COGNITIVE TASKS & ANALYSIS WHILST ANALYSING & CUEING ON 1ST & 2ND ORDER CONSEQUENCES OF REAL-TIME DECISIONS
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INNOVATIVE SOLUTIONS

□ ONE GLANCE

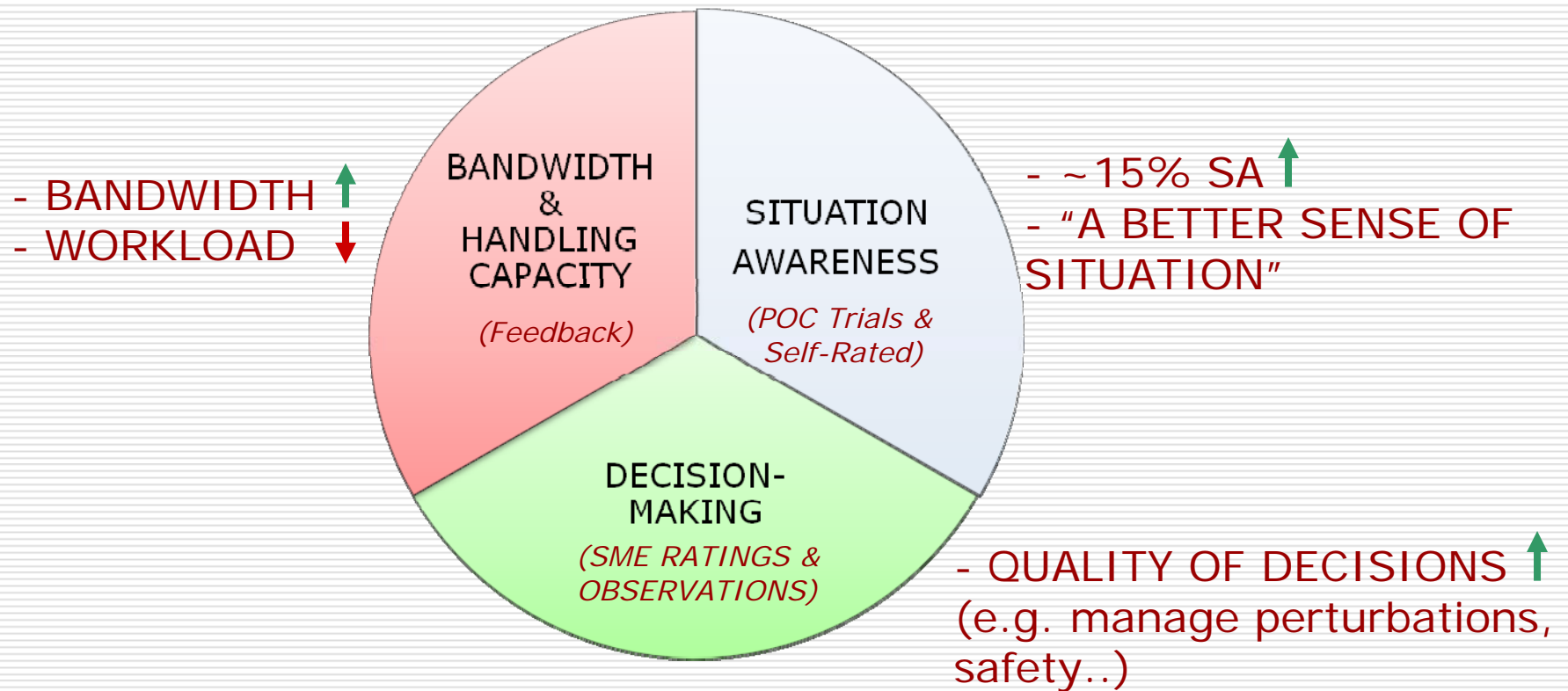
- ENHANCING ABILITY OF TOWER CONTROLLERS TO ACHIEVE COMPREHENSIVE AWARENESS QUICKLY AND IN CONTEXT.
 - SPEED UP INFO INGESTION, IMPROVE INFO ASSIMILATION AND SA FOR RAPID DECISION MAKING.
 - PROVIDE VISUAL ENVIRONMENT THAT CORRESPONDS TO ATC MENTAL MODELS
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ONE-GLANCE SNAP SHOT

- ❑ 2D & 3D WIDGETS
 - ❑ 3D VIRTUAL WORLD
 - ❑ PiP VIEW-THE WORLD AT FINGER-TIP
 - ❑ CRITICAL CUES
 - ❑ ENHANCED DISPLAY
 - ❑ WAM ME!!
 - ❑ CONFLICT MANAGEMENT
 - ❑ ANOMALY DETECTION
-

DISCOVERY

□ RESULTS (*OBSERVATIONS & FEEDBACK*)



GAME-CHANGER?

□ CIVIL DOMAIN

- GEOGRAPHICAL SEPARATION
 - MULTI PLATFORMS OPERATIONS
 - MANAGING PERTURBATION
 - SUSTAINING LOAD
 - ANTICIPATORY ACTIONS
 - MULTI AIRPORT OPERATIONS
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