

# SCIENCE

## Bold future of flight

Supernal, automotive giant Hyundai Motor Group's (HMG) aircraft-specific subsidiary, unveiled a product concept for its new, second-generation electric vertical take-off and landing (eVTOL) aircraft – the S-A2 – at the Consumer Electronics Show (CES) 2024 in Las Vegas on Jan 9. **The Straits Times** looks at what the craft can offer.

### TIMELINE

HMG's spendings on Supernal has, in roughly two years since its founding, topped nearly US\$1 billion (S\$1.34 billion). A combination of the former's technical know-how and mass-production capabilities has given the eVTOL arm the impetus to push ahead with its air taxi plans.

Jan 7, 2020

HMG partners with Uber Air to debut an eVTOL vehicle vision concept – the SA-1 – at CES 2020.

Nov 9, 2021

HMG forms a new company called Supernal to spearhead its eVTOL charge.

2023

Supernal opens three facilities: an engineering headquarters in Irvine, California; a policy and commercial office in Washington, DC; and an R&D facility in Fremont, California.

Jan 9, 2024

A full-scale mock-up of S-A2 is unveiled at CES 2024 (below).



By mid-2024

To apply for the certification of the vehicle in the United States.

End-2024

Initial test flights to begin.

2028

Launch of formal service if test requirements are met. The eVTOL will likely first be used to carry cargo.



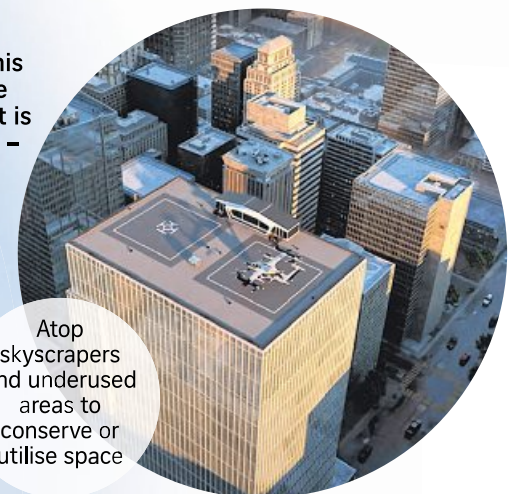
### VERTIPOD

#### What is it?

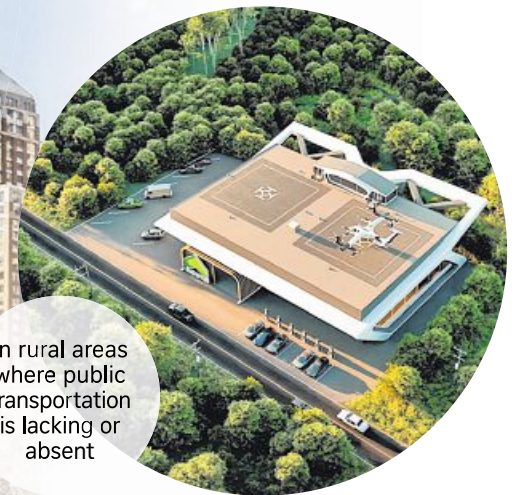
- A place where electric air vehicles arrive and depart.
- With vertipods built near existing transit infrastructure, electric air vehicles can help augment existing ground transportation options, fill gaps and add capacity to strained transit networks.
- It also doubles as a charging station, repair centre and company satellite office.

#### Locations

Location of this vital structure includes – but is not limited to – the following:



Atop skyscrapers and underused areas to conserve or utilise space



In rural areas where public transportation is lacking or absent



Near airports for convenience and better air connections between cities



Existing modes of ground transportation

### THE CRAFT

**Capacity**  
1 pilot, 4 passengers

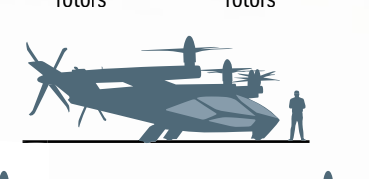
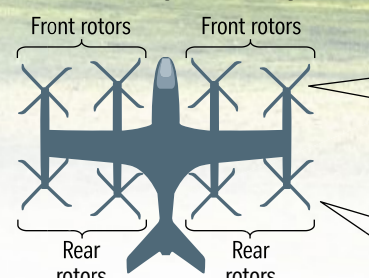
**Cruising speed**  
190kmh at a maximum altitude of 400m to 500m

**Average trip distance**  
40km-64km

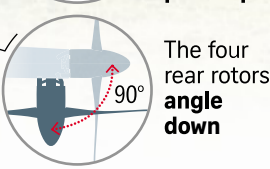
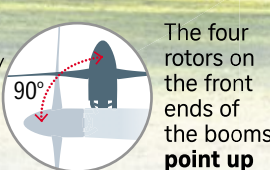
**Flight safety**  
Features safety critical systems that are required for commercial aviation such as flight controls, avionics and powertrain

**Operational noise**  
• Take-off and landing: 65 decibels (as quiet as a dishwasher)  
• Cruising: 45 decibels

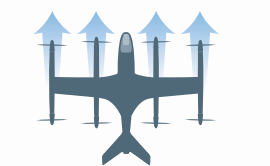
The 10m-long and 15m-wide aircraft has eight all-tilting rotors



During vertical take off and landing



Once in the air, all eight rotors swivel to a horizontal orientation for a more efficient fixed-wing flight



### KEY CHALLENGES

**Regulatory certifications** for eVTOLs to carry human passengers are expected to be lengthy and complex as no established certification methods exist.

**Batteries** pose the biggest technical challenge, as they account for up to 40 per cent of an eVTOL craft's weight.

Sources: SUPERNAL, HYUNDAI MOTOR GROUP, BLOOMBERG, CNET  
PHOTOS: SUPERNAL, ADOBE STOCK  
STRAITS TIMES GRAPHICS: LIM YONG

# Joint and muscle pain the top menopausal complaint here

It had moderate or severe impact on a third of the midlife women in two studies

Judith Tan  
Correspondent

Hot flushes, once thought to be the most common symptom among midlife women, have been knocked off their top spot.

Researchers here found that aches and pain in the muscles and joints are the top menopausal complaint among women in Singapore, affecting between 30 per cent and 40 per cent of them.

Yet, most doctors in Singapore and overseas do not recognise menopausal joint pain, often diagnosing the problem as the wear and tear of overuse or ageing.

Called arthralgia, it had moderate or severe impact on a third of the midlife women who participated in two studies conducted by the Integrated Women's Health Programme (IWHP) at the National University Hospital (NUH) and the National University of Singapore Yong Loo Lin School of Med-

icine (NUS Medicine) in 2023.

Both studies, focused on Chinese, Malay and Indian women – the three main races in Singapore – were funded by the Singapore National Medical Research Council under its Senior Clinician Scientist Award given to Professor Yong Eu Leong. The amount was about \$3.5 million for 2021 to 2025.

The first study, a ranking of menopausal symptoms published in October 2023 in *Maturitas*, an international journal that focuses on midlife and post-productive health, discovered that joint and muscular discomfort was the most reported symptom among women here.

More than three in five, or 62.5 per cent, of 1,054 Singaporean women reported symptoms of arthralgia during their menopause, compared with 27.5 per cent for sleep problems, 20.3 per cent for vaginal dryness, and 19.6 per cent for mental and physical exhaustion. Hot flushes were the fifth

most reported symptom, at 18.6 per cent.

"About 30 to 40 per cent of them complained of very severe joint or muscular discomfort," said Prof Yong, emeritus consultant in the Department of Obstetrics and Gynaecology at NUH.

Two participants, Madam Regina Lim, 58, and Ms Nicole Doyle, 52, were among those who reported muscle and joint pain.

Madam Lim used to run twice a week, but she began to suffer stiffness of her knees after reaching menopause about five years ago. This had not occurred before menopause.

"I thought my regular running affected my knees. I could not squat and my GP told me it was wear and tear," said Madam Lim, who works in the travel industry. She also suffered from poor sleep and would cry for no reason. "I also had brain fog, and it was not helpful because I needed my memory to help book clients on flights," she added.

It was only after being in the study that she realised her pain and other symptoms were related to her menopause.

Ms Doyle, an expatriate house-



(From left) Study participants Nicole Doyle and Regina Lim doing muscle strengthening exercises with NUH principal physiotherapist Cammy Tsai on Jan 12. ST PHOTO: GAVIN FOO

wife, went into menopause after a hysterectomy at age 44. For her, the hot flushes were the worst symptom.

"My family has a history of breast and ovarian cancer. When I had a growth in my fallopian tube, I went for a hysterectomy and had one ovary removed. Two years on, I developed hot flushes. It is overwhelming. I was in Europe one winter and while everyone had their coats on, I was in my singlet," she said.

Ms Doyle also has joint pain in her fingers, which she discovered when she went to draw the curtains one morning.

Prof Yong explained that arthral-

gia affects multiple joints – shoulders, fingers, knees, foot – "sending pain and stiffness, and it is debilitating". "Unfortunately, the world does not recognise menopausal joint pain," he added. "When it comes to menopausal symptoms of women in the West, hot flushes are usually No. 1."

The second study, published in December 2023 in *Climacteric*, the official journal of the International Menopause Society, confirmed the significance of arthralgia as a condition that affects midlife women.

It found that about 75 per cent of the study cohort of 1,120 midlife women suffered from some form of

arthralgia, ranging from mild to very severe, and it was associated with other menopausal symptoms, such as vaginal dryness, physical and mental exhaustion, and poor muscle strength.

Prof Yong said one proof that menopausal joint pain exists is that breast cancer patients who take an oestrogen inhibitor also suffer the same symptoms. The oestrogen inhibitor prevents the cancer from recurring, but mimics what happens in menopause, when the body stops producing oestrogen.

"Oestrogen levels in these women plummet because of this inhibitor, so half of these women suffer from the same type of pain like our menopausal women. These are young healthy women with breast cancer. So when they take the inhibitors, they suffer severe arthralgia. This is why I am convinced menopausal pain is real," he said.

Prof Yong pointed out that a study from the United States 20 years ago also found that women receiving hormone therapy had a lower incidence of neuromuscular pain than those who were not.

In response to these findings, Prof Yong said the IWHP will be working with physiotherapists at NUH to develop targeted interventions, such as exercise regimens to enhance muscle strength, and exploring menopausal hormone therapy to alleviate joint pain and improve overall well-being for midlife women.

This will also fill crucial gaps in the management of menopausal symptoms for women in Singapore.

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