# Thyroid cancer cells in space during the TEXUS-53 sounding rocket mission – The THYROID Project

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# both contributed equally to this work

**Supplementary Information Table 1 and Figure 1**

**Supplemental Table 1: Flight data of TEXUS-53**

**QUICKLOOK TEXUS – 53**

| | | |
|---|---|---|
| Launching date | **January, 23** | 2016 |
| Launching time | **09:30:00** | LT |
| µ-g Time | **367** | Sec |
| Payload weight | **400.1** | Kg |
| Payload length | **5215** | Mm |

**Motor First stage**

| | | |
|---|---|---|
| Peak thrust acceleration | 8.3g @ 2.2 | Sec |
| Mean thrust acceleration | 5.2 | G |
| Burnout | 11.9 | Sec |
| Motor Separation | 12.9 | Sec |

**Motor Second stage**

| | | |
|---|---|---|
| Ignition | 15.0 | Sec |
| Peak thrust acceleration | 12.1g @ 34.9 | Sec |
| Mean thrust acceleration | 6.6 | G |
| Burnout 0% | 43.4 | Sec |
| Spin at burnout (derived from rate sensor signal) | 2.8 | Hz |
| YoYo despin | 56.0 | Sec |
| Roll rate after YoYo despin | -18.7 @ 57.6 | °/sec |
| Motor separation | 59.0 | Sec |

**RCS Acquisition & Control**

| | | | |
|---|---|---|---|
| RCS enable | | 59.0 | Sec |
| Acquisition phase | | 59.0 – 66.0 | Sec |
| Manoeuvres at high thrust: | | | Sec |
| Manoeuvres at low thrust: | +Y | 399.6 – 403.8 | Sec |
| RCS low thrust enable | | 60.9 | Sec |
| Lateral Destabilization and Spin-up | | 458.3 | Sec |
| Achieved spin rate | | 151°/sec @ 476.3 | Sec |

**Zero-g phase**

| | | |
|---|---|---|
| µ-g achieved signal | 66.0 | Sec |

| | | |
|---|---|---|
| Start of zero-g (< 1* 10exp-4 at sensors) | 73.0 | Sec |
| Time of apogee (derived from GPS data) | 257.8 | Sec |
| Apogee (derived from GPS data) | 252.6 | Km |
| End of zero-g (> 1* 10exp-4 at sensors) | 440.0 | Sec |

**Reentry & Recovery**

| | | |
|---|---|---|
| Tip ejection | 55.3 | Sec |
| Reentry decelerations X= -15.4g Y= +9.7g Z=-0.2g | 480.7/479.7/482.0 | Sec |
| Maximum residual reentry deceleration | 15.7g @ 481.0 | Sec |
| Heat shield release | 4.3g @ 583.9 | Sec |
| Pilot parachute de-reefed | 3.8g @ 593.5 | Sec |
| Main parachute release | 608.5 | Sec |
| Main parachute de-reefed | 2.1g @ 620.1 | Sec |
| Sink rate | 7.8 | m/s |

**Housekeeping**

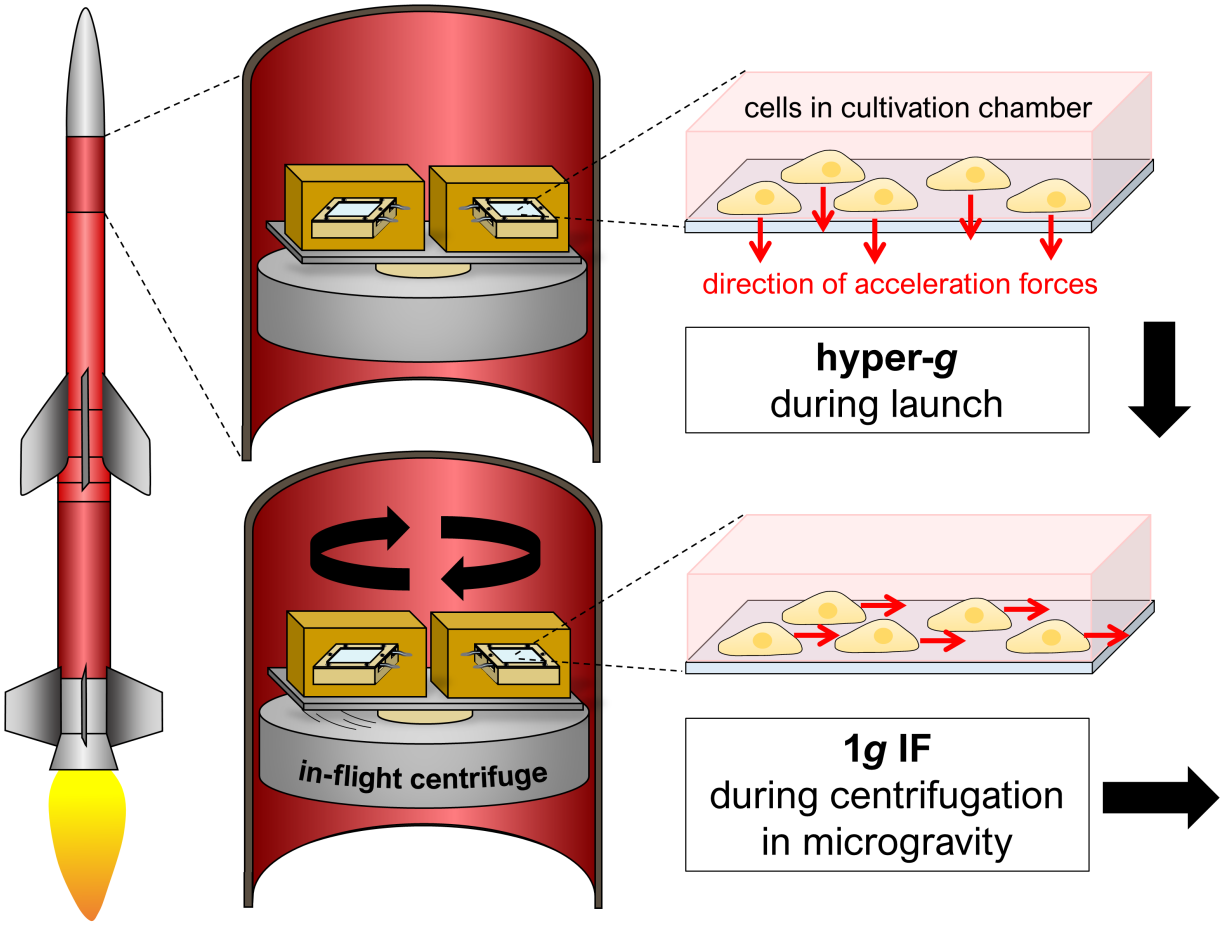
| | | |
|---|---|---|
| Maximal skin temperature descent (POS4) | 123.5°C @ 493.4 | Sec |

**General**

| | | |
|---|---|---|
| Loss of TM-Data & GPS last message at | 877.0 | Sec |
| Loss of GPS (4 samples) 0.0 – 3.0 | | Sec |
| Last coordinates derived from onboard GPS via TM | 68°30.1385’ | N |
| | 21°02.6830’ | E |
| Landing coordinates from onboard recorder | 68°30.1589’ | N |
| | 21°02.6645’ | E |
| Slant Range Distance (Azimuth = 357.9°) | 67.9 | Km |
| Landing Altitude | 640 | M |
| Impact decelerations (max.) X= -0.2g / Y= -0.3g / Z= 8.5g | 887.6/887.9/887.6 | Sec |
| Payload recovery time | 5:30 | H |
| Weather conditions | Fog in lower altitude, above clear sky | -23.5 °C |
| Air pressure (Launcher) | 975 | Mbar |
| Number of count-downs | 1 | |

## Supplementary Information

**Supplemental Figure 1: Illustration of the different acceleration stimulations during launch and microgravity phase.** In the hyper-*g* phase after lift-off the acceleration forces act perpendicularly towards the cells. When entering the microgravity phase the in-flight centrifuge turns on. Due to the special arrangement of the experimental units (brown boxes) on the pivotal platform, the cells are stimulated with 1*g* parallel to the cell growth surface. The figure was drawn from scratch by MK.


cells in cultivation chamber
direction of acceleration forces
hyper-*g*
during launch
in-flight centrifuge
1*g* IF
during centrifugation
in microgravity