



FIRST STEPS: TRAINING FOR SPACE



**FITNESS AND
NUTRITION**

MISSION DESCRIPTION

Just like an astronaut candidate, youth will undergo a test of physical fitness. The beep test was one of the challenges used in the most recent astronaut recruitment campaign. Participants will run to one side of a designated area and wait for a beep sound. They will then run back to their starting position. They will repeat this as the intervals between beeps get shorter. Once they can no longer reach the designated area in time with the beeps, they will stop the activity and record their results. Participants will then take part in a series of exercises to test balance, strength and endurance.

Difficulty: **MODERATE**

Duration: **30–45 MINUTES**

Materials: **MINIMAL**

MISSION PREPARATION

GOALS

Participants will develop a sense of their own physical limits and how this connects to an astronaut's training.

TIMELINE

Breakdown	Duration
Background	2 minutes
Educator's instructions/demonstration	5 minutes
Group activity	20–35 minutes
Wrap-up	3 minutes
Total	30–45 minutes

OBJECTIVES

By the end of the mission, participants will be able to

- Evaluate their muscular and cardiovascular endurance
- Understand why cardiovascular health is important to astronaut training
- Develop a greater understanding of the types of fitness tests used to evaluate astronaut recruits

MATERIALS

- Clear area suitable for running with a width of at least 20 metres
- Speakers to play the beep sound. Beep interval sounds can be found on YouTube or through a variety of apps for smart phones. Alternatively, a whistle could stand in for the beep sound.
- Cones or similar markers
- Timer
- Measuring tape
- Floor mats (optional)



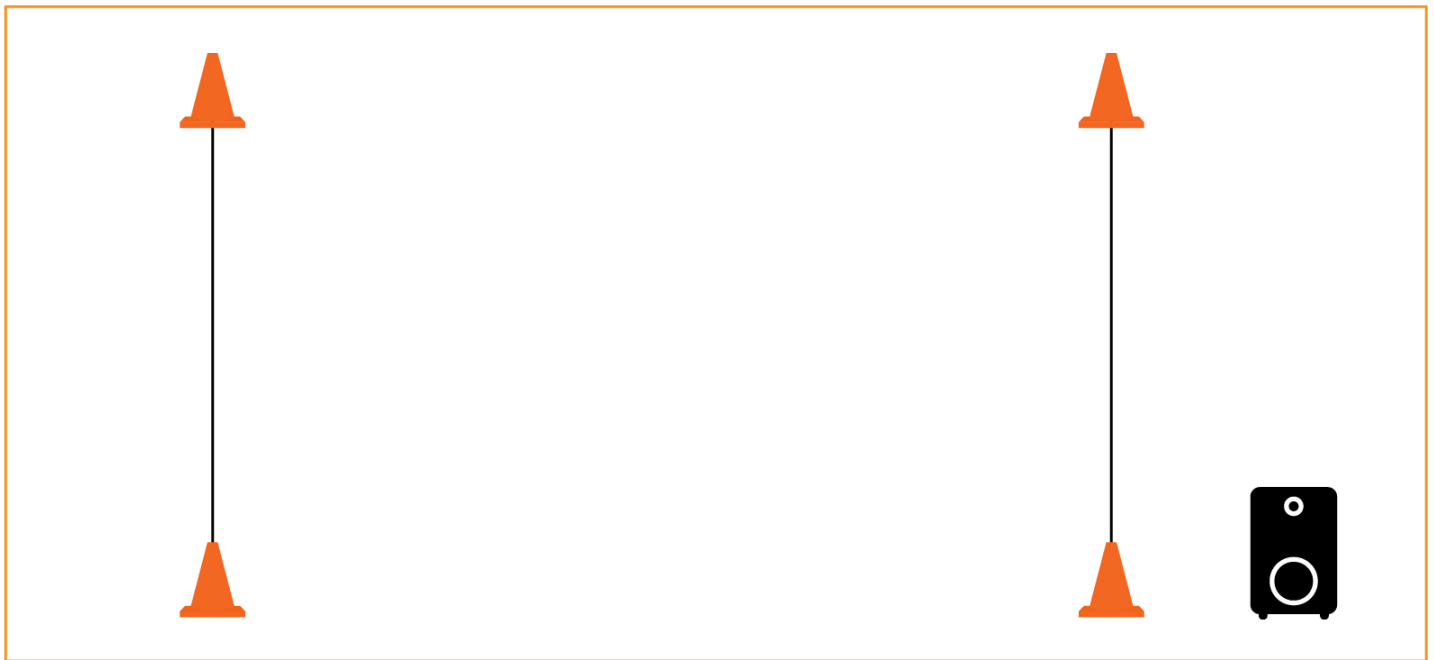
BACKGROUND

Physical fitness is very important if you are considering a career as an astronaut. In addition to having an education in science, technology, engineering or mathematics (STEM), astronauts are in excellent physical condition. Fitness and health are evaluated very closely throughout an astronaut's career. For example, Canadian Space Agency astronaut David Saint-Jacques went through many fitness tests before, during and after his space flight. These tests include the evaluation of maximal oxygen uptake (VO2 max) and submaximal estimates of VO2 max before, during and after long-duration International Space Station missions. This test is designed to measure how much physical exertion someone can sustain and whether this changes during long-duration space missions. By measuring VO2 max before, during and after space flight and by closely monitoring an astronaut's health during a space mission, experts aim to learn more about the effects of space flight on the body and improve astronaut physical training programs.

SET-UP

- Place one cone (or other marker) at your starting position and another 20 metres away
- Set up speaker to play timed beep or use whistle according to chart below
- Place gym mats to the side for secondary fitness activities (optional)

LAYOUT



Level	Laps	Cumulative laps	Speed (km/h)	Speed (mph)	Lap time (s)	Level time (s)	Level distance (m)	Cumulative distance (m)	Cumulative time (mm:ss)	Expected male age to complete level	Expected female age to complete level
1	7	7	8.5	5.3	8.47	67.76	140	140	1:08	7	8
2	8	15	9	5.6	8	64	160	300	2:12	9	10
3	8	23	9.5	5.9	7.58	60.63	160	460	3:12	10	11
4	9	32	10	6.2	7.2	64.8	180	640	4:17	11	12
5	9	41	10.5	6.5	6.86	61.71	180	820	5:19	12	13
6	10	51	11	6.8	6.55	65.45	200	1020	6:24	13	14
7	10	61	11.5	7.1	6.26	62.61	200	1220	7:27	14	16
8	11	72	12	7.5	6	66	220	1440	8:27	16	19
9	11	83	12.5	7.8	5.76	63.36	220	1660	9:30	17	21
10	11	94	13	8.1	5.54	60.92	220	1880	10:31	18	21+
11	12	106	13.5	8.4	5.33	64	240	2120	11:35	19	
12	12	118	14	8.7	5.14	61.71	240	2360	12:37	21+	
13	13	131	14.5	9	4.97	64.55	260	2620	13:42		
14	13	144	15	9.3	4.8	62.4	260	2880	14:44		
15	13	157	15.5	9.6	4.65	60.39	260	3140	15:44		
16	14	171	16	9.9	4.5	63	280	3420	16:47		
17	14	185	16.5	10.3	4.36	61.09	280	3700	17:48		
18	15	200	17	10.6	4.24	63.53	300	4000	18:52		
19	15	215	17.5	10.9	4.11	61.71	300	4300	19:54		
20	16	231	18	11.2	4	64	320	4620	20:54		
21	16	247	18.5	11.5	3.89	62.27	320	4940	21:56		

Source: Adapted from Wikipedia, 2019, *Multi-stage fitness test*. Adress: https://en.wikipedia.org/wiki/Multi-stage_fitness_test.

MISSION INSTRUCTIONS

A) 20-metre shuttle run test (beep test)

Place cones 20 metres apart. Use your speakers or whistle to make the beep sounds.

Youth will run from one marker to the other within the duration between beeps. Once they hear the beep, they can turn back and run the other way. As the interval between beeps decreases, youth will be challenged to run faster and faster to keep up with the pace of the beeps. When the participant can no longer keep up with the beep, they may stop and record their results.

B) Push-ups

Have youth lie on the ground in proper push-up position (see below). Participants perform push-ups with the proper technique until they can't do any more. Youth should record their results.

Proper push-up position:

1. Hands are placed directly under the shoulders
2. Legs are straight
3. Elbows bent
4. Raise the body until arms are completely straight
5. Bend elbows and bring body back to floor
6. Body should remain straight during lifting and lowering
7. Ideally neither the chin, nor the abdomen nor the legs should touch the ground

C) Sit-ups

Have youth perform sit-ups in proper position (see below). Participants perform sit-ups until they can't do anymore. Once the motion becomes too difficult to continue, have youth record their results.

Proper sit-up position:

1. Lie on back
2. Place feet flat on ground, knees bent at 90 degrees
3. Place hands on each side of the head (do not cradle head, or use hands to lift up neck!)
4. Keep hips on ground
5. Sit up and touch elbows to knees
6. Return to starting position, mindful of keeping back as straight as possible

D) Balance on one foot

Place hands across the body on opposite shoulders. Lift left foot so it is parallel with the right ankle but does not touch the right leg. Hold for as long as possible to a maximum of 45 seconds. Have youth record results. Repeat with the other leg. Time stops when:

1. Arms or hands move;
2. The raised foot moves closer to or away from the other leg or touches the ground;
3. The foot touching the ground moves;
4. Maximum time of 45 seconds has been reached.

For increased difficulty, have participants close their eyes!



REFERENCE PHOTOS

Proper push-up position



Proper sit-up position



Standing on one foot with arms crossed

