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BST-1: The first (and sole) rocket project of Israel Air Force Technical School, 1970-1971

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Abstract

ROCKETRY PROJECT AT ISRAEL AIRFORCE TECHNICAL SCHOOL Abstract This is another paper in a series of papers describing Israeli research rockets from the 1960's to the 1990's, built by students. After decades of research, the author accumulated sufficient information about the last rocketry project from the 1970's to be thoroughly presented. The 1971 project was held at the Israel Airforce technical school. The rocket (that was successfully launched) was a modified "Zuni" rocket (5 inches in diameter) that was donated to the group of students by the Israel Airforce. Some inputs to the paper are the product of an interview with an aerospace engineer that was of the mentors of the students.

Preface

This paper is a continuation of previous papers presented at the IAC, part of an ongoing effort to track the history of Israeli research rockets, from the 1960's onward. Included in the paper are some rockets never

known to the researcher's community, and by tracking their origins some interlacing connections to other early rocketry projects can be observed. This paper is the last part of the student rocketry projects of the 1970's in

Israel. Future papers will deal with research rockets at RAFAEL.

IAF Technical School

The school trains Israel Air Force cadets from the 9th or 10th grade through graduation from the 12th grade. Those who excel academically continue to the technological class (grade 13) and are eligible to receive a practical engineering certificate following 14th grade. Students with high grades have the option to continue their studies for a B.Sc. The Haifa based technical school embarked on a hands-on rocketry project in 1970, culminating with a successful launch of a rocket in 1971. The motivation for the project was a "competition" with other rocket projects of the time, built on various schools, and to boost the morale of the technical students.¹

The author was trying to find ex-students of the technical school that were part of the project for many years, with no success. Also, on the archives of the school itself, there is nothing on the rocket project. Some oral history was provided by Israel Zeierman, aerospace engineer who was involved with other student rockets of the

¹ For other rocket projects in Israel of the 1960s and 1970s in Israel, see the author's papers presented at IAC.

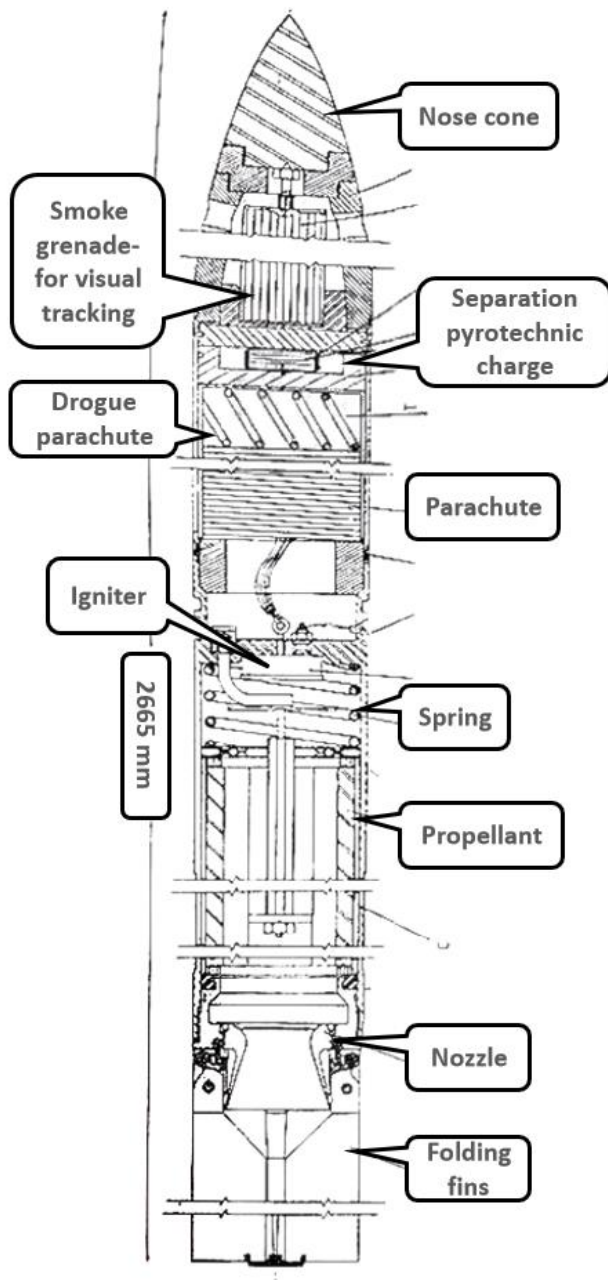
1960s and 1970s, who was a colleague of the engineer who supervised the BST-1 rocket project.

IAF Technical School

The BST-1 (BST stands for "Beit Sefer Techni" in Hebrew – Technical School) rocket was very different from ALL other student rockets of the time in Israel.

While other rockets were designed from scratch, with solid rocket motors either provided by Israeli Defense companies² OR were a product of indigenous design at the school itself, BST-1 was based on "off the shelf" "Zuni" 5 inches unguided air to ground rocket, provided by the Israel Airforce. Since the rocket was designed to be launched from a pod, the decision was made to use the canister as a ground launcher to the rocket. Since the students got a ready made and reliable rocket, the work was to modify the rocket and build a new payload and to include some scientific equipment inside.

² Such as RAFAEL or Israel Military Industries



Cross section of the BST-1 rocket³

Instead of the high explosive warhead of the original rocket BST-1 used a smoke grenade as payload and visual aid to track the rocket

during the descent phase. Also, a major change was building a separation mechanism to eject the forward section, using pyrotechnic charges, springs, and a set of two parachutes, drogue and main.

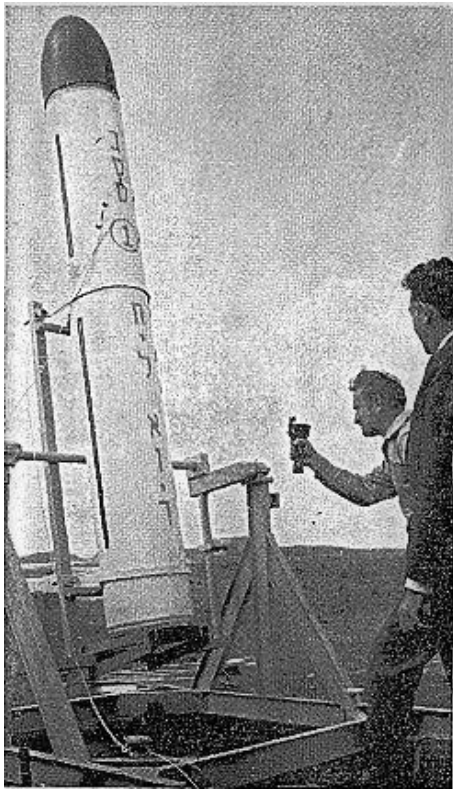
Technical characteristics

The rocket was a single stage rocket, 270 centimetres long, and 13 centimetres in diameter. Launch mass was 49 kilograms.⁴ The rocket was powered by a solid fuel rocket motor, with a 3400 kg thrust, operated for 1 second. The projected flight altitude was calculated to be around 20 kilometres.

As mentioned, the rocket was launched from a standard 4 rockets pod (Only one rocket was loaded for the launch) mounted on a student designed and built launch pad. The angle for the launch was 80 degrees, and the rocket was launched towards the Mediterranean Sea.

³ As appeared in "MADA" (Science) monthly, published by the Weizmann Institute of Science, April 1971. Scanned and notes by the author.

⁴ Quite heavy relative to other student rockets of the time in Israel



BST-1 on the launcher. Note the canister from which the rocket was launched.⁵

First launch attempt

The launch date was March 19, 1971. Two identical rockets were built and brought to the launch site. The decision to build two identical rockets had proven correct, since the first launch failed after the rocket's stabilizing fins didn't open correctly after the rocket exited its canister.

⁵ Image was scanned from "MAARIV" daily newspaper, March 21, 1971, retrieved from the historic newspaper collection of Israel's national library. Poor quality of the image is due to the scan (Not by the author).

The rocket tumbled and reached an altitude of 2 kilometres before crashing to the ground.



The sole high-quality picture of BST-1. The is rocket inserted to the launch canister⁶

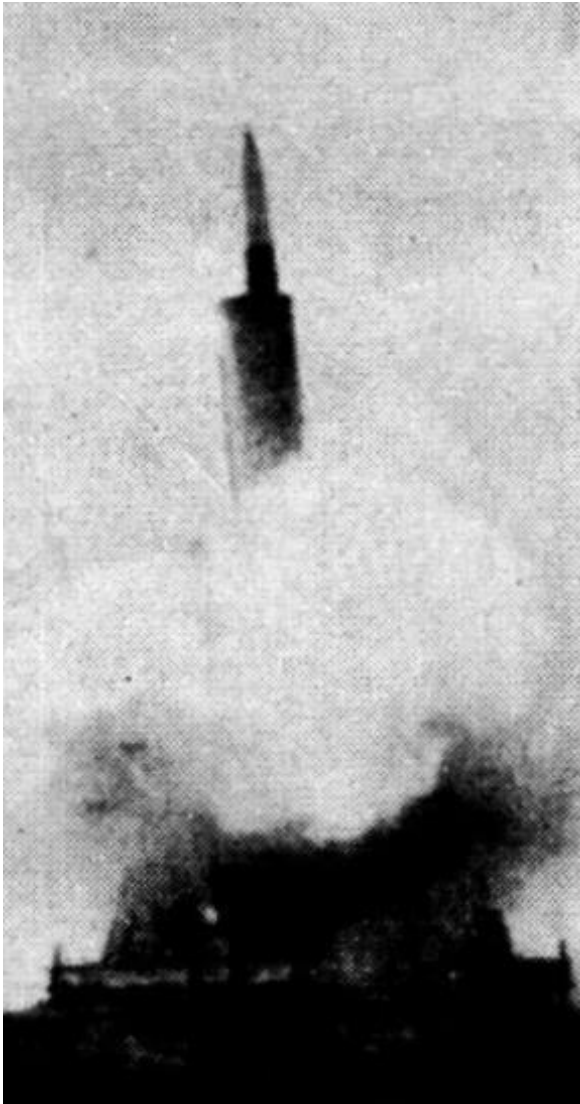
Second launch

The second rocket was loaded into the launcher at the same day of the failed launch and was successfully flown:

- The rocket reached a pick altitude of 18.5 kilometers (Less than the calculated target altitude).
- Velocity at the powered phase – 580 m/sec.
- The rocket reached its maximum altitude after 58 seconds.⁷

⁶ This is the SOLE high-quality picture that was available. The picture is in the author's collection and its story is described at the last paragraph of the paper.

⁷ All the accounts on the rocket performances were collected by the author from various newspapers



BST-1 rocket emerges from its canister⁸

of the time, accessed from the online collection of the Israel national library AND some scans made by the author in the 1990's from original printed magazine from 1971.

⁸ Image scanned from "Al Hamishmar" daily newspaper, March 21, 1971



BST-1 rocket in flight⁹

All in all, this rocket project was unique in the history of the air force technical school, as there were no follow-on projects – although a two-stage rocket was reported by Israeli media as the next project of the IAF technical school, expected "in a few months time".

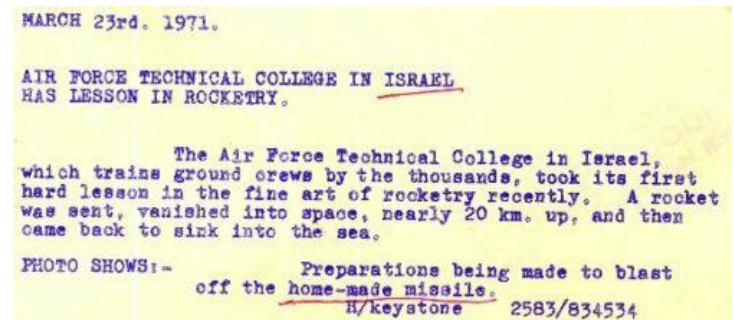
It is logical to assume that the death of engineer Ephraim Michaeli (In a car accident) in 1972 was a major blow to the project. Michaeli was a rocket scientist at RAFAEL¹⁰ and one of THE driving forces in all Israeli student rocketry projects of the time. The 1973 Yom Kippur war was another possible factor causing the end of interest in future developments of rockets at IAF technical school.

The (side) story of the picture

The author's interest in THIS (among other) rocket project could be tracked 43 years ago...as I was learned about it from an old magazine at the age of 12. Ever since a continuous effort was made to locate any information available, especially visual accounts (pictures, movies) of the rocket. It was in 2022 (!) 41 years after I learned about the rocket that I was suddenly came across an actual printed picture showing the rocket being loaded into the launcher. The picture was offered for sale on ebay. Of course, I bought the picture, which was an official press photo sent for distribution to international media. On the back of the picture there is a short description of the rocket project: "The Air Force technical college in Israel, which train ground crews

⁹ Maariv daily newspaper, March 26, 1971

by the thousands, took its first hard lesson in the fine art of rocketry. A rocket was sent, vanished into space, nearly 20 km up, and then came back to sink into the sea."



The back side of the sole high-quality picture from the BST-1 rocket¹¹

¹⁰ Then a part of Israel MOD

¹¹ A lot of effort was put in searching for OTHER pictures documented the launch – with no success.