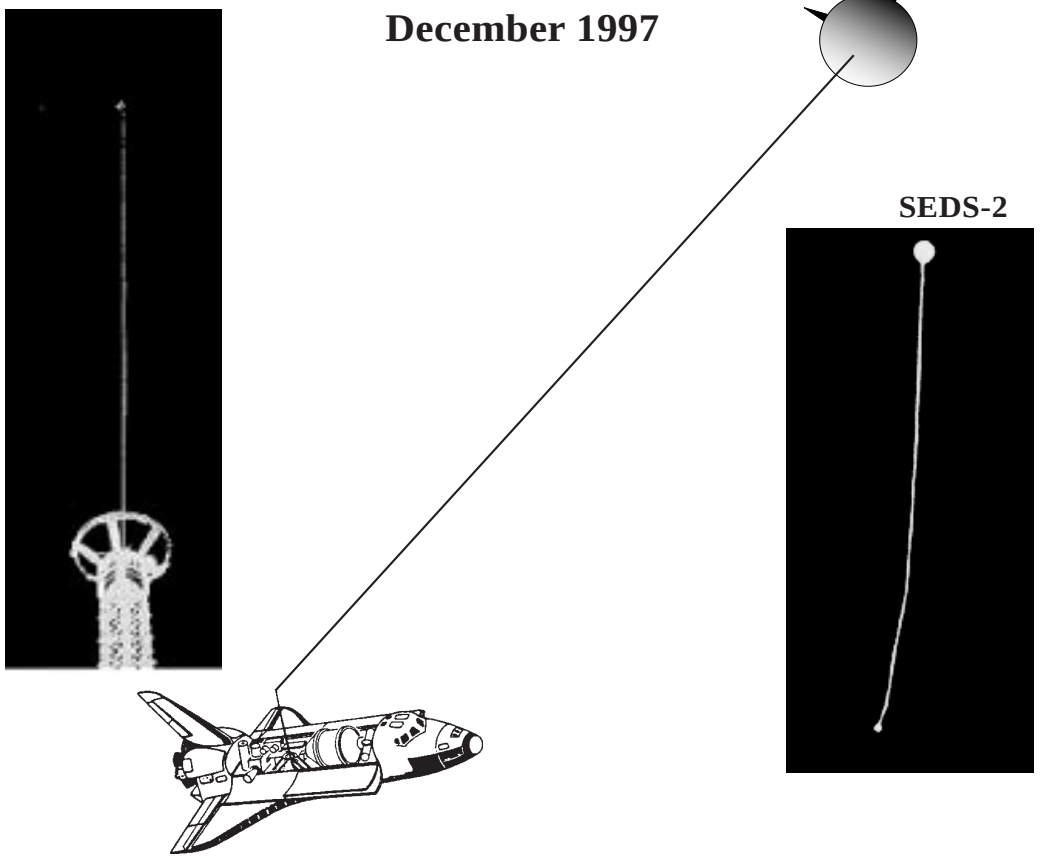
# Tethers In Space Handbook

**Third Edition**
**December 1997**

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***Prepared for***
**NASA Marshall Space Flight Center**

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for
NASA Marshall Space Flight Center
Grant NAG8-1160 monitored by C.C. Rupp
M.L. Cosmo and E.C. Lorenzini, Principal Investigators

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Front Cover: *(left) Photo of TSS-1 taken from the Shuttle cargo bay, 1992;*
*(right) Photo of SEDS-2 in orbit taken from the ground, 1994.*

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## FOREWORD

A new edition of the *Tethers in Space Handbook* was needed after the last edition published in 1989. Tether-related activities have been quite busy in the 90's. We have had the flights of TSS1 and TSS1-R, SEDS-1 and -2, PMG, TIPS and OEDIPUS. In less than three years there have been one international Conference on Tethers in Space, held in Washington DC, and three workshops, held at ESA/Estec in the Netherlands, at ISAS in Japan and at the University of Michigan, Ann Harbor. The community has grown and we finally have real flight data to compare our models with. The life of spaceborne tethers has not been always easy and we got our dose of setbacks, but we feel pretty optimistic for the future. We are just stepping out of the pioneering stage to start to use tethers for space science and technological applications. As we are writing this handbook TiPs, a NRL tether project is flying above our heads.

There is no emphasis in affirming that as of today spaceborne tethers are a reality and their potential is far from being fully appreciated. Consequently, a large amount of new information had to be incorporated into this new edition.

The general structure of the handbook has been left mostly unchanged. The past editors have set a style which we have not felt needed change. The section on the flights has been enriched with information on the scientific results. The categories of the applications have not been modified, and in some cases we have mentioned the existence of related flight data.

We felt that the section contributed by Joe Carroll, called *Tether Data*, should be maintained as it was, being a "classic" and still very accurate and not at all obsolete.

We have introduced a new chapter entitled *Space Science and Tethers* since flight experience has shown that tethers can complement other space-based investigations.

The bibliography has been updated. Due to the great production in the last few years we had to restrict our search to works published in refereed journal. The production, however, is much more extensive. In addition, we have included the summary of the papers presented at the last International Conference which was a forum for first-hand information on all the flights.

We would like to thank the previous editors, W. Baracat and C. Butner, P.Penzo and P. Amman, for having done such a good job in the past editions that has made ours much easier.

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