



**ARMSTRONG**

**OCCUPATIONAL OUTCOME IN MILITARY AVIATORS  
AFTER PSYCHIATRIC HOSPITALIZATION**

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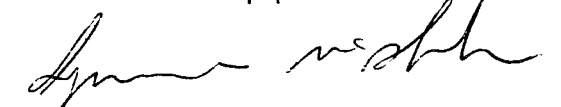
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<b>13. ABSTRACT</b> (Maximum 200 words)  This study examined whether psychiatric hospitalization precluded a return to the highly demanding occupational setting of flight duties in the USAF. A 7 year retrospective review of two computerized databases was joined by individual identifiers. One database contained psychiatric hospitalization information and the other confirmed occupational responsibilities. This is one of the first studies with the capability to join psychiatric hospitalization to longitudinal occupational follow-up. All USAF aviators (N = 214) were on flying status the quarter prior to psychiatric hospitalization between January 1986 and December 1990. Flying Status was evaluated for a minimum of 2 years after hospitalization to determine occupational outcome. By 2 years after admission, 138 aviators had returned to flying status. An affective disorder diagnosis was a significant predictor of poor occupational outcome (95% CI 1.94-17.33 p/ 0.0001). The impact of depression remained after factoring out length of hospitalization and the other univariate significant predictor of not returning to flying status. This study documents that nearly two-thirds (65.9%) of USAF aviators returned to flying status after psychiatric hospitalization. An affective disorder diagnosis significantly influences an aviator's occupational outcome. It is unclear whether this is due to institutional policy or a reflection of poor prognosis of these individuals.			
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## Contents

	Page
INTRODUCTION.....	3
METHODS.....	7
RESULTS.....	11
COMMENT.....	13
DISCUSSION.....	15
CONCLUSION.....	19
DISCLAIMERS.....	26
REFERENCES.....	27

## Tables

### Table

I	Diagnostic Groups and ICD-9 Codes.....	21
II	Baseline Characteristics of Study Cohort.....	22
III	Diagnostic Groups by Outcome.....	23
IV	Aviators Returning to Flying Status.....	24
V	Variables in Univariate Analysis of Returned Outcome.....	25

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Occupational Outcome in Military Aviators After Psychiatric  
Hospitalization

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INTRODUCTION

Successful flying is the cornerstone of the United States Air Force (USAF). Pilots, navigators, and the flight surgeons that care for them; are trusted with human lives, millions of dollars worth of equipment, and mission success. USAF aviators bear these responsibilities with a variety of coping styles. One would expect that the psychological cost of these physical and mental stressors that derive from flying is no less than those of commercial aviators. Because commercial aviation has been ranked as one of the most stressful uniformed occupations(16), psychiatric casualties could be expected among USAF aviators.

Scientists have been interested in medical conditions that threaten safe flight since military aviation began. In 1910, the German Air Force began studying the physiological reactions of pilots at altitude and developed rigid medical standards for aviators.(8) The British assigned "worn-out foot soldiers" to fly aircraft at the onset of World War I, but soon found that 60%

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of all aviation casualties were due to physical defects of the aviators.(8) Two years later after implementing medical screening through the Care of the Flyer Service, only 12% of pilot deaths were due to illness.(8) In 1914, the U.S. Army formed a medical board to define U.S. military aviator fitness for flight health standards. These requirements were established by a team of military physicians led by Major Theodore Lyster; and included a psychiatrist, Dr. Stewart Paton.(8)

Three generations later, in today's era of space planes, it is widely believed that 80% of all military mishaps are due to human factors. Aerospace human factors comprise a broad range of elements, one of which is the impact of health on occupational performance. It is the responsibility of aerospace medicine practitioners to minimize mishaps associated with physiological and psychological compromise through the close working relationship with aircrew members. At the USAF Aeromedical Consultation Service(ACS), in conjunction with USAF Surgeon General oversight, aviation medical standards for USAF aircrew are refined through evaluations and research. Using USAF regulations, medical conditions are defined that restrict an affected aviator from assuming the responsibility for aircraft control.

Once the medical condition has improved, restricted or "grounded" aviators may apply for reinstatement to flying duties. The

aerospace medicine practitioner, or flight surgeon, must strike a balance between the ending an aviator's military flying career against risking decreased mission performance by returning that aviator to flight status after a medical event. Following a psychiatric hospitalization, aviators are temporarily disqualified from flying. Aviators fear that it is nearly impossible to return to flying status after such an event (11), and the flight surgeon and consulting psychiatrist has been hampered by insufficient information to counsel the aviator. A similar dilemma has been described by Alexander (2) for air traffic controllers, who must either return to work free of medications or face career termination after psychiatric diagnosis.

In this retrospective analysis we sought predictors of successful return to aviation duty following psychiatric hospitalization. The majority of previous studies of military psychiatric hospitalizations have focused on enlisted personnel. In a single study on officer admissions, Corcoran and Humphreys studied USAF physicians in 1980.(7) Studies of hospitalized enlisted personnel reached the following conclusions: that military medical officers need more psychiatric training when practicing in isolated locations; that enlisted patients as a group were retarded in their occupational advancement prior to hospitalization; and that during the Vietnam War psychiatrically hospitalized Marines were more likely to be wounded after being returned to duty.(4, 12, 17) While identifying the occurrence of

psychiatric illness in an occupational setting is not unique to this paper, a focus on defining the ability to return to a previous occupational status after a psychiatric event is relatively new.

Occupational status was studied using the USAF military personnel database, where hospital data could be referenced by the unique personal identifier of social security number(SSAN). This system which reliably allowed us to track occupational outcomes after hospitalization overcame the problems noted in using civilian hospital data that lacked unique personal identifiers of patients.(18) A chronological record that links medical events to job status, can create perspective and add to the psychiatric outcome literature. The impact of a psychiatric hospitalization on returning to a challenging occupation can now be examined.

As USAF personnel strength dwindles, all officers will be tasked to a greater level of complexity and perhaps even longer periods of performance.(13) For instance, in Operation Desert Storm, B-52 bomb crews flew single missions lasting 30 hours or more. In such a high intensity environment, mental health data are needed that will identify factors that can predict a grounded aviator's successful return to flying duties.

## METHODS

### The USAF Databases

The USAF military personnel database is a computerized account of the vital statistics, occupational status, and identified "current" job of military individuals. The USAF uses this information to manage personnel accession and attrition, and to coordinate movements of individuals based on occupational needs. From this resource, an aviator's information could be found including rank and demographics, length of service, whether that person was ever qualified to fly, and whether the individual is currently qualified to fly. We looked at the USAF military personnel database records for each hospitalized individual from the quarter before admission through Mar 93.

The USAF inpatient database contains hospitalization information for USAF personnel, that includes Department of Defense (DOD) facilities or civilian hospitals when paid for with government funds. All demographic variables, diagnoses, dates of admission and discharge, and length of stay are available. The aviator's occupational and medical data was joined by unique individual identifiers of name and Social Security Number (SSAN).

Information can be accessed by monthly summaries: but, in this instance, it was examined by quarterly review for the study years of 1986 to 1990. Where an individual had several separated admissions, we used the first one, while immediate transfers were considered one hospitalization.

## Definitions

Once an officer has successfully completed aviation training, he or she is considered "rated," and this coding will be retained throughout a career, even if medically disqualified from flying. The reason for disqualification is noted in the database, as are the dates of disqualification and return to flying duties. We followed an aviator for return over a minimum of 24 months of occupational status from the time of hospitalization. By matching hospitalization data to occupational status, we formed a vector ("time series") for each rated flyer and entered data on time to return to flying status. A positive outcome is a return to "qualified" status within the follow up period.

USAF psychiatric hospitalizations require an evaluation and diagnosis based on DSM-III-R (3) criteria by a board certified or board eligible psychiatrist. We used only the primary diagnosis for the hospitalization. No computerized data exists to validate the diagnostic criteria. Diagnostic groups were formed using ICD-9 codes, after all the diagnoses were examined.(23) The affective disorder group included non-psychotic events of major depression, bipolar illness, and atypical depression. See Table I. [Table I Here]

Occupational outcome was defined as status within a minimum of two years after hospitalization. For an aviator to be included in the study, the officer must have been on flying status in the

quarter before psychiatric admission. This requirement prevented the false elevation of poor outcome percentages by including aviators already grounded for other reasons. The occupational information variable is a required datum entry by USAF regulations, so accurate maintenance of this information is expected. The aviator's monthly flying pay depends upon correct data on flying status in this database, which is another reason to expect that it is accurate. Active operational flying was indicated by the flying status code A.

Disqualification from flying duties was noted by numerical coding 0 - 9, but we considered any cause for disqualification to be equal in occupational outcome. This reduced the likelihood of artificially inflating positive results. While non-psychiatric medical conditions unknown to the investigators could elevate the percentage of poor outcomes, returning to flying status after the psychiatric hospitalization remains a clear indication of occupational recovery. A prolonged absence of information on an individual was considered an indication of release from active duty status, and was included in the poor outcome category.

### Subjects

On December 31, 1985 there were 39,884 rated officers identified in the USAF personnel database, and on December 31, 1990 there were 35,912. Among the 1114 rated and nonrated hospitalized officers of this period, an area of missing information regarding

flying qualifications excluded 47(4.2%) from review. The subjects for this study were all USAF aviators hospitalized with a primary psychiatric diagnosis in the years 1986 to 1990. USAF inpatient database entries of aviation officers hospitalized for a primary psychiatric diagnosis during the time period were examined, N=254.

Rated aviators who were not qualified to fly in the quarter before hospitalization were then excluded, N=40. Two hundred and fourteen aviators, N = 214, met the inclusion criteria. Baseline univariate comparisons of these individuals were done. There were no important differences in the demographic characteristics of the excluded group. Demographic information is noted in Table II. [Table II Here]

#### Statistical Methods

Univariate analysis was used to compare the target predictor variables and outcome groups of interest: returned to fly within the minimum follow-up period of 24 months, or did not return to fly. Comparisons were pairwise except where noted and all tests of significance were two-sided using Fisher's exact test or its corresponding Chi-square test. Continuous variables were compared using Student's t-test, and ANOVA; as appropriate. The chi-square statistic was used to compare categorical variables. Odds ratios and their confidence intervals were calculated for significant variables using standard methods.

A multiple logistic regression analysis was performed using the logistic regression technique in a commercial statistical software package to account for combined and separate effects of the variables. (21) From all data fields available in the databases, variables were selected which by the judgement of the investigators were best suited for analysis to predict outcome in these aviators. These variables are noted in Tables II, III and V. For instance, age/rank/service years could be considered occupationally important in the chance to return to fly; while number of days in the hospital, number of hospitalizations, and diagnosis might be clinically important in the prognosis of the aviator's psychiatric illness.

Variables were grouped according to length of exposure; continuous variables were dichotomized. All cut-point values for dichotomized variables were chosen when univariate data analysis yielded the most powerful significance. These are noted in Table V. These variables were then coded using 1 to indicate that a factor was present and 0 to indicate its absence. The logistic regression model was performed by the computer selecting and entering variables into the model using a stepwise approach, with  $p < 0.05$  as the criterion for accepting and removing newly entered terms.

## RESULTS

Two hundred and fifty-four rated officers were hospitalized

during the study period; 214 met inclusion criteria. The largest percentage of the cohort's diagnoses were in the alcoholism group, accounting for 121 aviators or 56.5% of the hospitalized group. Within the group of aviators who did not return to fly, there were more identified cases of psychosis (6.8% of disqualified group vs. 2.1% of the returned group) and affective disorders (16.4% of disqualified group vs. 2.8% of the returned group). More cases of minimal symptomatology (DSM-III-R "V" codes) and No Diagnosis were found in the group of aviators returning to flight status. Adjustment disorders accounted for almost equal percentages in both groups (13.7% in disqualified group vs. 16.3% in the returned group). See Table III. [Table III Here] Within the 2-year minimum follow-up period, 138 (64.5%) officers returned to flying status, and 76 (35.5%) did not. Of the 141 returned flyers over the 7 years of follow-up, 112 (79.4%) returned within 6 months and 126 (89.3%) returned within one year. See Table IV. [Table IV Here] One death occurred in the group, but the cause was not determined in our study.

On preliminary univariate analysis, we found a significant association between length of stay and return to flying status. This conclusion held using both the continuous valued length of stay, and categorized variable. We also found an overall difference in return rate among diagnosis groups and a specific association between affective disorders and return to flying

status. Social and demographic variables did not account for differences in occupational outcome. See Table V. [Table V Here]

In a logistic multiple regression analysis, the factors return/not returning, beddays ( $\leq 37$ ,  $> 37$ ) and affective disorder diagnosis (y, n) were fitted. The affective disorder group was the single most powerful variable explaining why aviators in the cohort did not return to qualified status  $\chi^2=12.86$ ,  $df=1$ ,  $p=0.0003$ .

#### COMMENT

Several biases must be considered when interpreting the data from this study. First, we could not capture data from all aviators who had mental health problems during this period, only those who were hospitalized. The rate of successful occupational return derived from this cohort may be an underestimate of success because only the most severe, i.e. "hospitalized" vs. "outpatient", cases were selected. Therefore, although all aviators treated for mental health disorders are not accounted for, this post hospitalization study can still be a reasonable description of the effect of a mental health event on a USAF aviation career.

We selected only aviators who were actively flying the quarter before their hospitalization. We made this choice to reduce the risk that factors other than psychiatric hospitalization caused

the subject aviator to be disqualified. For instance, an aviator may have been disqualified for medical illness prior to the psychiatric illness. Although psychiatrically hospitalized and disqualified, nonpsychiatric reasons prevented the aviator from returning to fly. This would have caused our "disqualified" outcome group to be spuriously larger. Our study design gives us the most power in describing a positive outcome group: aviators who returned to fly despite psychiatric treatment and diagnosis. Outcomes for the 40 officers who were not flying in the quarter prior to hospitalization are not considered in this study. Their impact on the accuracy of our "disqualified" outcome group data should be considered.

There remains the possibility that some aviation officers obtained inpatient psychiatric treatment at their own expense. Cases in the study are identified by government accounting. However, personally assuming the cost of inpatient treatment, and hiding from the workplace for a typical length of treatment would take tremendous planning and financial resources. We have assumed that there are few, if any, of these cases.

There was a variable length of follow-up for individuals in the study. Some had 7 years of follow-up while others had only 2, depending upon time of admission. Therefore, this data cannot comment on the long-term occupational outcome of these aviators. It can shed light only on short term job recovery after

hospitalization.

#### DISCUSSION

The major strengths of this study are: the joining of hospitalization and occupational datasets by unique personal identifiers and chronology, the examination of occupational status before and after psychiatric hospitalization, and the necessity for the occupational data to be accurate because the aviator's salary will be affected. We could find no other studies that have examined occupational outcome in professional aviators after psychiatric hospitalization for this breadth of diagnoses. Our study answers the question of short term occupational recovery after a psychiatric illness.

Table III highlights three common diagnoses psychiatrically and provides information on their impact on returning to a military aviation career. Adjustment disorder is a time limited condition (by definition, this disorder cannot last greater than 6 months) which describes a change in daily functioning related to a significant emotional event. Unlike alcoholism and depression which may have a chronic course in worst cases, adjustment disorder by definition cannot be chronic. One would expect most of these aviators to return to fly, rather than representing an equal percentage in the disqualified group (13.7% in the disqualified group vs. 16.3% in the returned group.)

Social and demographic factors were not significant in their influence on occupational outcome, although greater years in the service approached significance. Rather, the individual predictors of an affective disorder diagnosis or length of stay greater than 37 days pointed to poor occupational recovery. Prolonged hospitalization would intuitively indicate a more severe illness. Recently, evidence of improved prognosis for depressed patients was linked with prolonged medication treatment.(15) Few medications, and no psychoactive medications, are permitted to be taken by qualified aviators. Therefore, a depression that required continued medication to prevent relapse would cause continued disqualification.

Broadhead and colleagues (5) described an almost five times greater risk of occupational disability when depressed individuals were compared to asymptomatic controls based on follow-up interviews. Our study can only describe inpatient events, but the occupational impact we have noted in this study is significant. Individuals may be involuntarily separated from the USAF, if there is a prolonged recovery period following an illness. Aviators could choose to leave the stressful military flying environment after a depression.

However, in the last 4 years at the USAF Aeromedical Consultation Service, Brooks AFB, 70.0% of depressed aviators treated as inpatients and/or outpatients were recommended for return to

flying status. Therefore, the reason for the exceptionally poor outcome for the aviators with affective disorders in this study is unclear. While severity of illness could be the mitigating factor, it is also possible that in past years the medical label of "depression" has been sufficient for removal from the cockpit. One recommendation might be that all aviators considered for permanent disqualification due to depression, should have the opportunity for a final evaluation by a flight surgeon/psychiatrist at the USAF Aeromedical Consultation Service.

Heavy alcohol use among aircrew has been associated with the lore of military aviation. This study suggests that alcoholism is a mental health concern in this population. Further study might clarify why this condition accounts for more than half (56.5%) of all psychiatric inpatient treatment of this cohort. Cloninger and colleagues (6) revealed that individuals who were prone to abuse alcohol exhibited the personality tendencies of high novelty seeking, low harm avoidance, and reward dependence.

The personality structure of the military aviator is complex. (1, 9, 14) Perhaps the personal attributes necessary to perform well in the exciting, but dangerous job of military aviation predispose some aviators to abuse alcohol as a stress coping strategy. (10) Returning to flying status was not precluded by alcohol treatment, per se, however; because 70.2% (85 of 121) of these aircrew returned to flying status. Commercial aviators

have had even higher rates of success. (10, 19)

Overall, this study points to good short term occupational recovery following psychiatric hospitalization for USAF aviators. How can this be? One reason may be the favorable personality characteristics of these individuals for mental health treatment success. Psychotherapy candidates have a better prognosis when: a) they are highly motivated to engage in treatment, b) they are intelligent, and c) they are better educated. (22, 24) Aviation officers fit these criteria, which may partly explain the 64.5% rate of return within 2 years. These results are similar to a study of state police officers (both inpatient and outpatient) where 61% returned to duty after psychiatric assessment. (20) The progressive nature of the USAF in returning these individuals to their jobs identifies a strength in the military system.

Consider the alternative. If the treatment of medical conditions that affect flying safety always meant permanent disqualification for aviators, it is likely that these individuals would hide their symptoms until failure. This is an expensive approach to managing highly skilled individuals, whose years of flying experience are absent in a new aviator. Psychiatric conditions, like all medical conditions, have the best treatment outcome with early identification and intervention. While aviators may never be eager to see their flight surgeon for fear of temporary disqualification, the possibility of medical help that returns

them to flying status is a "win-win" situation.

This study identifies a focal point to improve the health and occupational functioning of USAF aviators. Primary prevention could have a dramatic impact on the loss of aviators to alcoholism, which accounted for 49.3% (36 of 73) of those not returning to flying status in the 7 year period under study. As aircraft and flying those aircraft become increasingly complex, stress coping skills in USAF aviators will be crucial for success. This study promises potential long term benefits if alcoholism prevention is implemented in aviator health care.

#### CONCLUSION

In this study, we described USAF aviators who were hospitalized for psychiatric reasons and the short term occupational impact of treatment. The ability to link occupational function chronologically to hospitalization was one of its key strengths. To keep the facts in perspective, one must remember that very few USAF aviators require hospitalization for psychiatric reasons. Our findings show that when psychiatric hospitalization occurs, 64.5% are returned to flying status within 2 years of their mental health event and 65.9% returned over a 7 year period. Preventive interventions for alcoholism and affective disorders in this population could significantly decrease the loss of experienced aviators. Finally, providing professional treatment for aviators teach optimal stress coping skills, and possibly

conserve USAF aviator resources. Early detection and treatment of mental illness could be the critical factor of mission success in the smaller aviator force of the future.

TABLE I. Diagnostic Groups and ICD-9 Codes

Disorder Groups	Includes ICD-9 Codes
V-Codes	V61.1/.41/.8, V62.2, V71.01
No Diagnosis	V71.09, V70.2
Organic Brain Syndromes	310.2
Psychotic/Delusional	295.4, 296.15/.82, 297.9, 298.8
Affective	296.2x/.3x/.4x/.7, 311.0
Anxiety/Dissociative	300.00/.01/.02/.3
Dysthymia/Somatoform/ Sexual/Eating	300.11/.16/.9, 306.1, 307.49/.81
Personality	301.81/.83/.84
Alcohol Related	291.0/.8, 303.01/.90/.91/.92/.93, 305.00/.01/.02/.03
Drug Related	305.6
Adjustment	309.0/.24/.28/.3/.4/.81/.82/.9

TABLE II. Baseline Characteristics of Study Cohort\*

Characteristic	Returned (N=141)	Not Returned (N=73)	Not Included (N=40)	p
Age, yrst†	37.3 ± 7.2	38.1 ± 7.0	37.8 ± 7.1	0.73
Beddays†	19.7 ± 14.6	31.0 ± 29.1	27.9 ± 22.9	<.001
Rank (%)				0.99
<Captain	53 (37.6)	27 (37.0)	15 (37.5)	
>Captain	88 (62.4)	46 (63.0)	25 (62.5)	
Service, yrst	13.8 ± 6.7	15.1 ± 7.1	14.6 ± 7.2	0.43
Sex, M/F	138/3	73/0	39/1	0.44
Race, NonW/W	6/135	2/71	0/40	0.39
No. admits (%)				0.39
1	112 (79.4)	63 (86.3)	32 (80.0)	
2	22 (15.6)	9 (12.3)	6 (15.0)	
3	5 (3.6)	1 (1.4)	1 (2.5)	
4	2 (1.4)	0	0	
5	0	0	1 (2.5)	

\* The values for demographic and clinical variables are shown for the sample classified by occupational status.

† Values are mean ± standard deviation.

TABLE III. Diagnostic Groups by Outcome

Diagnosis Group	Returned (N=141)	Not Returned (N=73)
V Codes	6(4.2)	0
No Diagnosis	4(2.8)	1(1.4)
OBS	2(1.4)	1(1.4)
Psychosis	3(2.1)	5(6.9)
Affective	4(2.8)	12(16.9)
Anxiety	4(2.8)	2(2.7)
Dysthymia, etc.	8(5.7)	4(5.5)
Personality	2(1.4)	1(1.4)
Alcohol	85(60.3)	36(49.3)
Drugs	0	1(1.4)
Adjustment	23(16.3)	10(13.7)

( ) are percent in column.

TABLE IV. Aviators Returning to Flying Status

Quarter from Admission, Returned	Number Returned	Per Cent Returned	Per Cent Cumulative
Same	111	51.9	51.9
One	1	0.5	52.3
Two	5	2.3	54.7
Three	9	4.3	58.9
Four	5	2.3	61.2
Five	4	1.9	63.1
Six	1	0.5	63.6
Seven	2	0.9	64.5
Nine	2	0.9	65.4
Eleven	1	0.5	65.9

TABLE V. Variables in Univariate Analysis of Returned Outcome

Variable	Returned (N=141)	Not Returned (N=73)	OR	p
Age, at admit				
≤ 40 yo	90 (63.8)	38 (52.1)	0.61	0.11
> 40 yo	51 (36.2)	35 (47.9)		
Gender				
Female	3 (2.1)	0	n/a	0.55
Male	138 (97.9)	73 (100)		
Race				
Non White	6 (4.3)	2 (2.7)	1.57	0.72
White	135 (95.7)	71 (97.3)		
Beddays				
≤ 37 days	127 (90.1)	58 (79.5)	0.42	0.03
> 37 days	14 (9.9)	15 (20.5)		
Rank				
≤ Major	96 (68.1)	44 (60.3)	0.71	0.29
> Major	45 (31.9)	29 (39.7)		
Years, Service				
≤ 18 yrs	106 (75.2)	46 (63.0)	0.56	0.08
> 18 yrs	35 (24.8)	27 (37.0)		
Diagnosis				
Affective	4 (2.8)	12 (16.4)	0.15	<0.001
Not Affective	137 (97.2)	61 (83.6)		
Admits				
One	112 (79.4)	63 (86.3)	1.63	0.26
> One	29 (20.6)	10 (13.7)		

( ) are percent of each variable category for column outcome.

### Disclaimers

The opinions, interpretations, conclusions, and recommendations are those of the authors and are not necessarily endorsed by the U.S. Air Force.

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